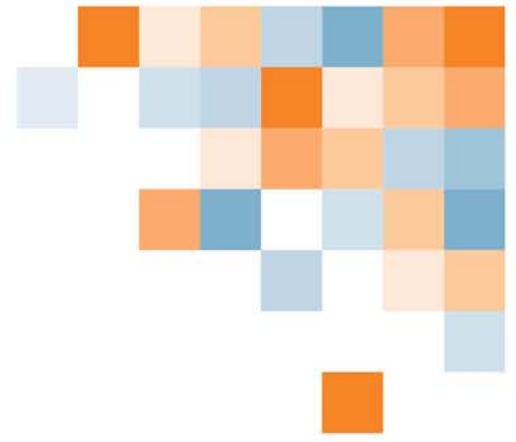


**ita**  
**YOUR TICKET.**



## PROGRAM OUTLINE

Automotive Service Technician  
Foundation



**To order additional copies please contact:**

Government Publications Services

PO Box 9452 Stn Prov Govt

Victoria, BC V8W 9V7

Phone: 250 387-6409 or

Toll Free: 1 800 663-6105

Fax: 250 387-1120

[www.publications.gov.bc.ca](http://www.publications.gov.bc.ca)

**Copyright © 2009 Industry Training Authority**

This publication may not be reproduced in any form without permission by the  
Industry Training Authority

Contact Director, Government Publications Services, Queen's Printer at 250 356-6876



# **AUTOMOTIVE SERVICE TECHNICIAN FOUNDATION PROGRAM OUTLINE**

**2009**

**Developed By  
Industry Training Authority  
Province of British Columbia**



## FOREWORD

This Program Outline is issued by the Automotive Training Standards Organization for use in foundation training classes sponsored by the Automotive Training Standards Organization. Indentured apprentices will be directed to the Apprenticeship Training classes in accordance with the General Regulations made pursuant to the “Industry Training and Apprenticeship Act” of British Columbia.

This Program Outline is intended to be used as a guide for instructors of the foundation program. Practical instruction by demonstration and student participation should be integrated into classroom sessions. Safe working practices, even though not always specified in each operation or topic, are an implied part of the program and should be stressed throughout the delivery of the program. It is the responsibility of employers to ensure safety training for the apprentices working on their worksites.

The “Content” portion of each competency is to be considered as a guide only, and is not intended to be exhaustive.

A glossary of verbs is included at the end of the program outline. This inclusion is to help clarify the intent of the “learning objective” and “learning task” statements. Also included at the end of the program outline are a competency profile chart and a list of tools and equipment necessary to offer the training.

The Program Outline was prepared with the advice and assistance of representatives of management and labour and in cooperation with the Automotive Training Standards Organization.

The Automotive Training Standards Organization would also like to acknowledge the dedication and hard work of:

Jim Davies  
 Tim Drewcock  
 Fred Grimann  
 Rob Grosse  
 Ben Hircock  
 Mike Howells  
 Russ Hunter  
 Robert Lang

Jason Leber  
 Art Lilley  
 Mike McPhail  
 Ron Osterman  
 Ton van Luyn  
 Greg Buerk  
 Steve Perry

### **SAFETY ADVISORY**

Be advised that references to the WorkSafe BC safety regulations contained within these materials do not/may not reflect the most recent Occupational Health and Safety Regulation (the current Standards and Regulation in BC can be obtained on the following website: <http://www.worksafebc.com>. Please note that it is always the responsibility of any person using these materials to inform him/herself about the Occupational Health and Safety Regulation pertaining to his/her work.



## TABLE OF CONTENTS

<b>Foreword</b> .....	i
<b>Section 1 – Occupation Analysis Chart</b> .....	1
<b>Section 2 – AST Foundation Program Outline</b> .....	5
Schedule of Time Allotment for AST Foundation .....	6
<b>Section 3 – Facility Requirements</b> .....	86
Instructor Requirements.....	87
Facility Requirements.....	88
Tools and Equipment List.....	89
Foundation Texts and Manual List.....	94
Glossary .....	95



# **SECTION 1**

## **OCCUPATION ANALYSIS CHART**



## AST Foundation Program Occupation Analysis Chart

<b>Workplace Safety</b>  <div style="text-align: right;">Line A</div>	Describe WCB Regulations	Describe WHMIS Regulations	Demonstrate Safe Vehicle Operation	Demonstrate Safe Work Practices		
	A1 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	A2 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	A3 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	A4 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		
<b>Employability Skills</b>  <div style="text-align: right;">Line B</div>	Demonstrate Communication Skills	Describe Business Practices	Demonstrate Employment Readiness Skills			
	B1 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	B2 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	B3 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
<b>Tools and Equipment</b>  <div style="text-align: right;">Line C</div>	Use Hand Tools	Use Measuring Instruments	Use Power Tools	Use Fasteners	Use Shop Tools and Equipment	Use Reference Resources
	C1 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	C2 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	C3 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	C4 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	C5 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	C6 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
	Use Diagnostic Equipment					
	C7 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>					



**General Automotive Maintenance**  
Line D

Select Lubricants and Fluids  
D1

Perform Cooling System Maintenance  
D2

Perform Exhaust System Maintenance  
D3

Perform Transmission Maintenance  
D4

Service Filters, Belts and Hoses  
D5

Replace Exterior Lamps  
D6

Service Body Trim, Hardware and Accessories  
D7

Service Tires and Wheels  
D8

Service Spindles and Hubs  
D9

**General Automotive Practices**  
Line E

Assess Leaks  
E1

Service Gaskets and Seals  
E2

Describe Diagnostic Procedures  
E3

Describe Fuel Delivery Systems  
E4

Describe Internal Combustion Engine Principles  
E5

Describe Vehicle Emissions  
E6

Demonstrate Welding Techniques  
E7

**Brake Systems**  
Line F

Service Tubing and Fittings  
F1

Service Brake Hydraulic Systems  
F2

Service Drum Brake Systems  
F3

Service Disc Brake Systems  
F4

Inspect Power Assist Systems  
F5

Service Anti-Lock Brake Systems  
F6





**Steering Systems**  
Line G

Service Steering Gears  
G1

Service Passenger Restraint Systems  
G2

Service Steering Columns  
G3

Service Steering Linkage  
G4

Service Power Steering Systems  
G5

Perform Wheel Alignments  
G6

Describe Four Wheel Steering Systems  
G7

**Suspension Systems**  
Line H

Service Bearings and Bushings  
H1

Describe Frame Types  
H2

Describe Suspension Systems  
H3

Describe Electronic Suspension Systems  
H4

Service Spring Types  
H5

Service Suspension Components  
H6

Service Shocks and Struts  
H7

s

**Basic Electrical Systems**  
Line I

Describe Principles of Electricity  
I1

Describe Principles of Electronics  
I2

Service Wiring Harnesses  
I3

Service Batteries  
I4

Describe Engine Management System  
I5

Describe Ignition Systems  
I6



**SECTION 2**

**AUTOMOTIVE SERVICE TECHNICIAN**

**FOUNDATION PROGRAM OUTLINE**



## AST FOUNDATION PROGRAM OUTLINE WITH SUGGESTED TIME ALLOTMENT

	<u>Theory</u>	<u>Practical</u>	<u>Total</u>	<u>Weighting</u>
<b>Line A Workplace Safety</b>	<b>10</b>	<b>20</b>	<b>30</b>	<b>4%</b>
A-1 Describe Worksafe BC Regulations	2	4		<u>Credit</u>
A-2 Describe W.H.M.I.S. Regulations	2	4		2
A-3 Demonstrate Safe Vehicle Operation	1	5		
A-4 Demonstrate Safe Work Practices	5	7		
<b>Line B Employability Skills</b>	<b>16</b>	<b>14</b>	<b>30</b>	<b>3%</b>
B-1 Demonstrate Communication Skills	3	6		<u>Credit</u>
B-2 Describe Business Practices	3	6		2
*B-3 Demonstrate Employment Readiness Skills	10	2		
<b>Line C Tools and Equipment</b>	<b>25</b>	<b>65</b>	<b>90</b>	<b>10.00%</b>
C-1 Use Hand Tools	3	9		<u>Credit</u>
C-2 Use Measuring Instruments	4	14		6
C-3 Use Power Tools	4	8		
C-4 Use Fasteners	8	16		
C-5 Use Shop Tools and Equipment	4	8		
C-6 Use Reference Resources	2	4		
*C-7 Use Diagnostic Equipment	0	6		
<b>Line D General Automotive Maintenance</b>	<b>46</b>	<b>116</b>	<b>162</b>	<b>18.00%</b>
D-1 Select Lubricants and Fluids	2	4		<u>Credit</u>
*D-2 Perform Cooling System Maintenance	6	12		7.2
*D-3 Perform Exhaust System Maintenance	4	8		
*D-4 Perform Transmission Maintenance	4	14		
D-5 Service Filters, Belts, and Hoses	8	16		
D-6 Replace Exterior Lamps	4	8		
D-7 Service Body Trim, Hardware and Accessories	6	12		
D-8 Service Tires and Wheels	8	34		
D-9 Service Spindles and Hubs	4	8		
<b>Line E General Automotive Practices</b>	<b>50</b>	<b>40</b>	<b>90</b>	<b>10.00%</b>
*E-1 Assess Leaks	2	4		<u>Credit</u>
*E-2 Service Gaskets and Seals	4	8		6
E-3 Describe Diagnostic Procedures	6	0		
*E-4 Describe Fuel Delivery Systems	2	4		
*E-5 Describe Internal Combustion Engine Principles	18	0		
*E-6 Describe Vehicle Emissions	12	0		



E-7 Demonstrate Welding Techniques	6	24		
	<b>Theory</b>	<b>Practical</b>	<b>Total</b>	<b>Weighting</b>
<b>Line F Brakes Systems</b>	<b>43</b>	<b>95</b>	<b>138</b>	<b>15%</b>
F-1 Service Tubing and Fittings	3	9		<b>Credit</b>
F-2 Service Brake Hydraulic Systems	14	16		<b>9.2</b>
F-3 Service Drum Brake Systems	8	22		
F-4 Service Disc Brake Systems	8	22		
F-5 Inspect Power Assist Systems	4	8		
F-6 Service Anti-lock Brake Systems	6	18		
<b>Line G Steering Systems</b>	<b>39</b>	<b>105</b>	<b>144</b>	<b>16%</b>
G-1 Service Steering Gears	10	20		<b>Credit</b>
G-2 Service Passenger Restraint Systems	4	20		
G-3 Service Steering Columns	2	10		<b>8</b>
G-4 Service Steering Linkage	4	14		
G-5 Inspect Power Steering Systems	8	21		
G-6 Perform Wheel Alignments	10	20		
*G-7 Describe Four Wheel Steering Systems	1	0		
<b>Line H Suspension Systems</b>	<b>34</b>	<b>50</b>	<b>84</b>	<b>9%</b>
H-1 Service Bearings and Bushings	4	8		
H-2 Describe Frame Types	6	0		
H-3 Describe Suspension Systems	6	0		
H-4 Describe Electronic Suspension Systems	6	0		
H-5 Service Spring Types	4	14		
H-6 Service Suspension Components	4	20		
H-7 Service Shocks and Struts	4	8		
<b>Line I Basic Electrical Systems</b>	<b>60</b>	<b>72</b>	<b>132</b>	<b>14%</b>
I-1 Describe Principles of Electricity	12	18		<b>Credit</b>
I-2 Describe Principles of Electronics	6	6		<b>10.4</b>
I-3 Service Wiring Harnesses	10	20		
I-4 Service Batteries	8	16		
*I-5 Describe Engine Management Systems	12	6		
*I-6 Describe Ignition Systems	12	6		
			<b>TOTAL CREDIT</b>	<b>60</b>
	<b>Theory</b>	<b>Practical</b>		<b>Total</b>
	323	577		900
	35.89%	64.11%		



\* Indicates background information not covered in first year.

# **PROGRAM OUTLINE FOR FOUNDATION LEVEL**



**LINE: A                      WORKPLACE SAFETY**  
**Competency:              A - 1 Describe Worksafe BC Regulations**

- Learning Objectives**
1. The learner will be able to describe the application of the parts of the Worker’s Compensation Act outlined in the Occupational Health and Safety Regulations.
  2. The learner will be able to describe the application of the Occupational Health and Safety Regulations and how to find requirements applicable to the automotive service technician’s workplace.

<b>Learning tasks</b>	<b>Content</b>
1. Define terms used in the Worker’s Compensation Act	<ul style="list-style-type: none"> <li>• Definitions, section 1 of the act</li> </ul>
2. Describe the conditions under which compensation will be paid	<ul style="list-style-type: none"> <li>• Part 1, division 2 of the act</li> </ul>
3. Describe the Worksafe BC young workers resources	<ul style="list-style-type: none"> <li>• E-resources by group</li> <li>• Resources by industry</li> <li>• Top seven dangers</li> <li>• Safety talks</li> </ul>
4. State the general duties of employers, employees and others	<ul style="list-style-type: none"> <li>• Part 2, division 3, sections 115-124 of the act</li> </ul>
5. State the Workers Compensation Act requirements for the reporting of accidents	<ul style="list-style-type: none"> <li>• Part 1, division 5 sections 53 and 54 of the act</li> </ul>
6. State the “Core Requirements” of the Occupational Health and Safety Regulation	<ul style="list-style-type: none"> <li>• Definitions</li> <li>• Application</li> <li>• Rights and Responsibilities               <ul style="list-style-type: none"> <li>- Health and safety programs</li> <li>- Investigations and reports</li> <li>- Workplace inspections</li> <li>- Right to refuse work</li> </ul> </li> <li>• General conditions               <ul style="list-style-type: none"> <li>- Building and equipment safety</li> <li>- Emergency preparedness</li> <li>- Preventing violence</li> <li>- Working alone</li> <li>- Ergonomics</li> <li>- Illumination</li> <li>- Indoor air quality</li> <li>- Smoking and lunchrooms</li> </ul> </li> </ul>



7. State the “General Hazard Requirements” of the Occupational Health and Safety Regulation
  - Chemical and biological substances
  - Substance specific requirements
  - Noise, vibration, radiation and temperature
  - Personal protective clothing and equipment
  - De-energize and lockout
  - Tools, machinery and equipment
  - Cranes and hoists
  - Electrical safety

**Achievement Criteria:**

Given a written and/or a practical assessment on Worksafe BC Regulations, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: A                      WORKPLACE SAFETY**  
**Competency:            A - 2 Describe Workplace Hazardous Materials Information System (WHMIS) Regulations**

- Learning Objectives**
1. The learner will be able to describe the purpose of the Workplace Hazardous Materials Information System (WHMIS) Regulations.
  2. The learner will be able to explain the contents of material safety data sheets (MSDS).
  3. The learner will be able to explain the contents of a WHMIS label

<b>Learning tasks</b>	<b>Content</b>
1. State the legislation that requires suppliers of hazardous materials to provide MSDS and label products as a condition of sale and importation	<ul style="list-style-type: none"> <li>• Hazardous product act</li> <li>• Controlled products regulations</li> <li>• Ingredient disclosure list</li> <li>• Hazardous materials information               <ul style="list-style-type: none"> <li>- review act</li> </ul> </li> <li>• Hazardous materials information               <ul style="list-style-type: none"> <li>- review regulations</li> </ul> </li> </ul>
2. State the purpose of the Workplace Hazardous Materials Information System (WHMIS)	<ul style="list-style-type: none"> <li>• Protection of Canadian workers from the adverse effects of hazardous materials through the provision of relevant information while minimizing the economic impact on industry and the discretion of trade               <ul style="list-style-type: none"> <li>- Recognition of rights</li> <li>- Workers</li> <li>- Employers</li> <li>- Suppliers</li> <li>- Regulators</li> </ul> </li> </ul>
3. Describe the key elements of WHMIS	<ul style="list-style-type: none"> <li>• Material Safety Data Sheets (MSDS)</li> <li>• Labeling of containers of hazardous materials</li> <li>• Worker education programs</li> </ul>
4. Describe the responsibilities of suppliers under WHMIS	<ul style="list-style-type: none"> <li>• Provide               <ul style="list-style-type: none"> <li>- MSDS</li> <li>- Labels</li> </ul> </li> </ul>
5. Describe the responsibilities of employers under WHMIS	<ul style="list-style-type: none"> <li>• Provide               <ul style="list-style-type: none"> <li>- MSDS</li> <li>- Labels</li> <li>- Work education programs in the workplace</li> </ul> </li> </ul>





6. State the “General Hazard Requirements” of the Occupational Health and Safety Regulation
  - Hazardous ingredients
  - Preparation information
  - Product information
  - Physical data
  - Fire or explosion
  - Reactivity data
  - Toxicological properties
  - Preventive measures
  - First-aid measures
  
7. Identify symbols found on WHMIS labels and their meaning
  - Compressed gases
  - Flammable and combustible materials
  - Oxidizing materials
  - Poisonous and infection materials
    - Acute toxic effects
    - Other toxic effects
    - Bio-hazardous infections materials
  - Corrosive materials
  - Dangerously reactive materials
  
8. Demonstrate how WHMIS applies to hazardous materials used in the shop
  - Use, storage and disposal of;
    - Solvents
    - Caustic cleaners
    - Cleaning solutions
    - Gasoline
    - Diesel fuel
    - L.P.G.
    - C.N.G.
    - Asbestos
    - Battery acid
    - Refrigerants
    - Brake fluid
    - Antifreeze
    - Lubricants
    - Tracer dyes

**Achievement Criteria:**

Given a written and/or a practical assessment on WHMIS, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



## LINE A: WORKPLACE SAFETY

### Competency: A-3 Demonstrate Safe Vehicle Operation

#### Learning Objectives:

1. The learner will be able to perform a walk around inspection prior to operating a vehicle.
2. The learner will be able to safely operate a vehicle.

<b>LEARNING TASKS</b>	<b>CONTENT</b>
1. Describe licensing pre-requirements	<ul style="list-style-type: none"> <li>• Drivers license requirements</li> <li>• Use of repair plates</li> </ul>
2. Perform vehicle safety inspection requirements	<ul style="list-style-type: none"> <li>• Walk around               <ul style="list-style-type: none"> <li>– Tires and wheels</li> <li>– Area clear</li> <li>– Tools put away</li> </ul> </li> <li>• Brakes</li> <li>• Steering</li> <li>• Final check on work completed</li> </ul>
3. Describe shop driving safety rules	<ul style="list-style-type: none"> <li>• Right of ways</li> <li>• Etiquette</li> </ul>
4. Operate a vehicle in a shop	<ul style="list-style-type: none"> <li>• Speed limit</li> <li>• Safety considerations</li> <li>• Parking on hoist</li> <li>• Road tests</li> </ul>

#### Achievement Criteria:

Given a written and/or a practical assessment on Workplace Safety the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: A                      WORKPLACE SAFETY**  
**Competency:              A - 4 Demonstrate Safe Work Practices**

- Learning Objectives**
1. The learner will be able to apply personal safety measures.
  2. The learner will be able to identify and use shop emergency equipment
  3. The learner will be able to prevent, identify and extinguish various classes of fires.

<b>Learning tasks</b>	<b>Content</b>
1. Apply personal safety precautions and procedures	<ul style="list-style-type: none"> <li>• Personal apparel               <ul style="list-style-type: none"> <li>- Clothing</li> <li>- Hair and beards</li> <li>- Jewelry</li> </ul> </li> <li>• Personal protection               <ul style="list-style-type: none"> <li>- Head</li> <li>- Hands</li> <li>- Lungs</li> <li>- Eyes</li> <li>- Ears</li> <li>- Feet</li> </ul> </li> <li>• Housekeeping</li> <li>• Ventilation systems</li> <li>• Clear head</li> <li>• Horseplay</li> <li>• Respect for others safety</li> <li>• Constant awareness of surroundings</li> <li>• Lifting</li> </ul>
2. Locate shop emergency equipment and means of egress	<ul style="list-style-type: none"> <li>• Emergency shutoffs</li> <li>• Fire control systems</li> <li>• Eye wash facilities</li> <li>• Emergency exits</li> <li>• First aid facilities</li> <li>• Emergency contact / phone numbers</li> <li>• Outside meeting place</li> <li>• Disaster meeting place</li> </ul>
3. Describe the conditions and classifications of fires	<ul style="list-style-type: none"> <li>• Conditions to support fire               <ul style="list-style-type: none"> <li>- Air</li> <li>- Fuel</li> <li>- Heat</li> </ul> </li> <li>• Classes of fires               <ul style="list-style-type: none"> <li>- A – combustibles</li> <li>- B – liquids</li> <li>- C – electrical</li> <li>- D – metals</li> </ul> </li> <li>• Symbols and colours</li> </ul>



4. Describe fire safety precautions when working near, handling or storing flammables
  - Fuels
    - Diesel
    - Gasoline
    - Propane
    - Natural gas
  - Lubricants
  - Oily rags
  - Combustible metals
  - Aerosols
  
5. Describe the considerations and procedures to extinguish a fire
  - Warning others and fire department
  - Evacuation of others
  - Fire contained and not spreading
  - Personal method of egress
  - Training
  - P.A.S.S.
    - Point
    - Aim
    - Squeeze
    - Sweep

**Achievement Criteria:**

Given a written and/or a practical assessment on Safe Work Practices, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: B                      EMPLOYABILITY SKILLS**  
**Competency:            B - 1 Demonstrate Communication Skills**

**Learning Objectives**            1. The learner will be able to clearly demonstrate both oral and written communication using trade terminology.

<b>Learning tasks</b>	<b>Content</b>
1. Explain the importance of learning and using correct trade terminology	<ul style="list-style-type: none"> <li>• Taking instructions</li> <li>• Giving instructions</li> <li>• Ordering parts</li> <li>• Explaining concepts</li> </ul>
2. Use and maintain record keeping	<ul style="list-style-type: none"> <li>• Service / work order</li> <li>• Parts requisition</li> <li>• Purchase order</li> <li>• Technical reports</li> <li>• Time card</li> <li>• Vehicle maintenance log</li> <li>• Maintenance schedule</li> </ul>
3. Use written reports	<ul style="list-style-type: none"> <li>• Service</li> <li>• Instructional</li> <li>• Technical</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Communication Skills, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: B**                      **EMPLOYABILITY SKILLS**  
**Competency: B – 2 Describe Business Practices**

- Learning Objectives**
1. The learner will be able to describe the career path of an automotive technician.
  2. The learner will be able to describe effective methods of shop management and recycling programs.

<b>Learning tasks</b>	<b>Content</b>
1. Describe the hierarchy of control within an automotive repair shop	<ul style="list-style-type: none"> <li>• Owner</li> <li>• Service manager</li> <li>• Foreman</li> <li>• Journey person</li> <li>• Apprentice</li> <li>• Lube person</li> <li>• Detailer</li> </ul>
2. Describe shop efficiency and shop management methods	<ul style="list-style-type: none"> <li>• Flat rate</li> <li>• Hourly</li> <li>• Salary</li> <li>• Personal productivity</li> <li>• Incentive programs</li> </ul>
3. Describe recycling programs	<ul style="list-style-type: none"> <li>• Material costs</li> <li>• Minimizing waste</li> <li>• Most cost effective method</li> <li>• Disposal of hazardous materials</li> </ul>
4. Describe best management practices	<ul style="list-style-type: none"> <li>• Storage, disposal and recycling of automotive wastes               <ul style="list-style-type: none"> <li>- Fluids</li> <li>- Batteries</li> <li>- Tires</li> <li>- Metal</li> <li>- Plastics</li> </ul> </li> <li>• Storage and containment</li> <li>• Parts cleaning and degreasing</li> <li>• Spill response and clean up</li> <li>• Record keeping</li> <li>• Oil and water separators               <ul style="list-style-type: none"> <li>- inspection, cleaning and operation</li> </ul> </li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Business Practices, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: B                      EMPLOYABILITY SKILLS**  
**Competency:              B - 3 Demonstrate Employment Readiness Skills**

**Learning Objectives**      1. The learner will be able to demonstrate the skills required to obtain and retain employment

<b>Learning tasks</b>	<b>Content</b>
<p>1. Describe the responsibilities of employees and expectations employers have of employees</p>	<ul style="list-style-type: none"> <li>• Communication               <ul style="list-style-type: none"> <li>- Use of trade language</li> <li>- Reading and comprehending</li> <li>- Writing</li> </ul> </li>   <li>• Thinking               <ul style="list-style-type: none"> <li>- Problem solving and decision making</li> <li>- Use of mathematics</li> <li>- Use of current technology</li> <li>- Ability to research</li> </ul> </li>   <li>• Desire to continue learning</li>   <li>• Positive attitude               <ul style="list-style-type: none"> <li>- Self esteem</li> <li>- Confidence</li> <li>- Honesty and integrity</li> <li>- Initiative</li> <li>- Energy</li> <li>- Persistence</li> <li>- Cooperative</li> </ul> </li>   <li>• Responsibility               <ul style="list-style-type: none"> <li>- Dependability</li> <li>- Goal and priority setting</li> <li>- Time management</li> <li>- Money management</li> <li>- Punctuality</li> </ul> </li> </ul>



- Adaptability
    - Positive attitude towards change
    - Respect for other diversity and differences
    - Creativity
    - Flexible
  - Team skills
    - Work with others
    - Group planning
    - Respect for others thoughts and opinions
    - Leadership when appropriate
    - Ability to handle conflict
    - Self control
  - Care for quality
  - Personal care
    - Clean
    - Neat
    - Dress appropriately
    - Rested
    - No substance abuse
  - Following safety regulations
2. Describe responsibilities of employers and expectations employees have of employers
- Respect
  - Trust
  - Fairness
  - Care
  - Concern
  - Feelings
  - Safe work site
  - Timely payment
3. Describe responsibilities employees have to customers
- Vehicle protection precautions
    - Smoking
    - Fender covers
    - Road testing
  - Privacy





4. Prepare a resume
  - Gathering information
    - Goals
    - Skills
    - Education
      - Dates
    - Experience
      - Dates
      - Relationships and responsibilities
    - Activities
    - References
  - Statements of accomplishment
    - Challenge
    - Action
      - Skills applied
    - Results
  - Types of resumes
    - Chronological
    - Functional
    - Generic
    - Specific
5. Prepare a letter of introduction
  - Not to exceed one page
  - Highlight important accomplishments in same order as they appear in the job posting
6. Identify job search resources
  - Newspapers
  - Internet
  - Networking
  - Industry publications
  - Direct approach
7. Prepare for an interview
  - Research of the organization
  - Review of job qualifications
  - Prepare for broad personal questions
  - Review of resume
  - Interview practice
  - Arriving ahead of time
  - Appropriate dress



**Achievement Criteria:**

Given a written and/or a practical assessment on Employment Readiness Skills the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: C                      TOOLS AND EQUIPMENT**  
**Competency:              C - 1 Use Hand Tools**

- Learning Objectives**
1. The learner will be able to select the appropriate tool for a task.
  2. The learner will be able to demonstrate the safe use of technician's hand tools.

<b>Learning tasks</b>	<b>Content</b>
1. Describe various general hand tools	<ul style="list-style-type: none"> <li>• General               <ul style="list-style-type: none"> <li>- Purchase quality</li> <li>- Insurance</li> <li>- Orderly storage (tool chest)</li> <li>- Cleaning and maintenance</li> <li>- Used for intended purpose</li> <li>- Proximity to other people</li> <li>- Personal protective equipment</li> <li>- Ventilation</li> </ul> </li> <li>• Wrenches</li> <li>• Socket wrenches</li> <li>• Screwdrivers</li> <li>• Pliers</li> <li>• Hammers</li> </ul>
2. Describe special application hand tools	<ul style="list-style-type: none"> <li>• Punches</li> <li>• Chisels</li> <li>• Pry bars</li> <li>• Files</li> <li>• Saws</li> <li>• Vices and clamps</li> <li>• Scrapers and brushes</li> <li>• Pickup tools and mirrors</li> <li>• Pullers and slide hammers</li> <li>• Fender / seat covers</li> </ul>
3. Use various general hand tools	<ul style="list-style-type: none"> <li>• Wrenches</li> <li>• Socket wrenches</li> <li>• Screwdrivers</li> <li>• Pliers</li> <li>• Hammers</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Hand Tools, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: C**                      **TOOLS AND EQUIPMENT**  
**Competency:**            **C – 2 Use Measuring Instruments**

**Learning Objectives**

1. The learner will be able to select appropriate measuring instruments.
2. The learner will be able to use measuring instruments with required speed and accuracy.

<b>Learning tasks</b>	<b>Content</b>
1. Describe measuring tools	<ul style="list-style-type: none"> <li>• Steel rules</li> <li>• Straightedge</li> <li>• Tapes</li> <li>• Calipers and dividers               <ul style="list-style-type: none"> <li>- Inside</li> <li>- Outside</li> <li>- Dividers</li> <li>- Vernier</li> </ul> </li> <li>• Micrometers               <ul style="list-style-type: none"> <li>- Inside</li> <li>- Outside</li> <li>- Depth</li> </ul> </li> <li>• Telescoping gauges</li> <li>• Ball gauges</li> <li>• Plastigauge</li> <li>• Feeler gauges</li> <li>• Dial indicator               <ul style="list-style-type: none"> <li>- Bore gauges</li> </ul> </li> <li>• Torque wrenches</li> <li>• Torque to yield angle meter</li> <li>• Torque sticks</li> <li>• Brake pad thickness gauge</li> </ul>
2. Use Measuring Tools	<ul style="list-style-type: none"> <li>• Micrometer</li> <li>• Vernier Calipers</li> <li>• Torque wrench</li> <li>• Dial indicator</li> <li>• Feeler gauge</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Measuring Instruments, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: C                      TOOLS AND EQUIPMENT**  
**Competency:              C - 3 Use Power Tools**

**Learning Objectives**                      1. The learner will be able to select and demonstrate the safe use of power tools.

<b>Learning tasks</b>	<b>Content</b>
1. Describe power tools	<ul style="list-style-type: none"> <li>• General               <ul style="list-style-type: none"> <li>- Purchase quality</li> <li>- Insurance</li> <li>- Orderly storage (tool chest)</li> <li>- Cleaning and maintenance</li> <li>- Used for intended purpose</li> <li>- Proximity to other people</li> <li>- Personal protective equipment</li> <li>- Ventilation</li> <li>- Emergency shutdown</li> </ul> </li> <li>• Air tools               <ul style="list-style-type: none"> <li>- Maintenance and safety</li> <li>- Water filters</li> <li>- Lubricators</li> <li>- Pressure regulators</li> <li>- Air hose</li> <li>- Impact wrenches</li> <li>- Ratchets</li> <li>- Impact sockets and extensions</li> <li>- Air hammers</li> <li>- Blow guns</li> <li>- Drills</li> <li>- Rotary brushes</li> <li>- Grinders</li> </ul> </li> <li>• Electric tools               <ul style="list-style-type: none"> <li>- Grounded or double insulated</li> <li>- Maintenance and safety</li> <li>- Portable drills                   <ul style="list-style-type: none"> <li>- Bit selection and maintenance</li> </ul> </li> <li>- Impact wrenches</li> <li>- Saws</li> <li>- Grinders</li> <li>- Work lights</li> <li>- Soldering irons and guns</li> <li>- Battery chargers</li> </ul> </li> </ul>



2. Use air powered tools
  - Ratchet
  - Gun
  - Butterfly
  - Air grinder
  - Blow nozzle
  - Drill
  - Lubrication and care
  
3. Use electric powered tools
  - Hand drill
  - Drill press
  - Angle grinder
  - Heat gun
  - Work light

**Achievement Criteria:**

Given a written and/or a practical assessment on Power Tools, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: C**                      **TOOLS AND EQUIPMENT**  
**Competency: C - 4 Use Fasteners**

**Learning Objectives**

1. The learner will be able to select threaded and non threaded fasteners.
2. The learner will be able to remove and replace fasteners.
3. The learner will be able to identify causes of faster failure.
4. The learner will be able to remove broken fasteners and repair threads.

**Learning tasks**

1. Describe threaded fastener terminology

**Content**

- Nominal sizes
- Major and minor diameter
- Head markings and tensile strength
- Pitch and thread angle
- Thread series
  - UNC
  - UNF
  - NPT
  - Metric
- Right and left hand threads
- Classes or fits

2. Select and use threaded fasteners

- Fastener materials
- Bolts
- Studs
- Nuts
  - Hex
  - Castle
  - Slotted hex
  - Self locking
  - Wing
  - Speed
- Self tapping screws
- Sheet metal screws
- Set screws
- Machine screws



3. Torque fasteners to specifications
  - Torque definition
  - Tension
  - Elastic limit
  - Distortion
  - Tensile strength
  - Torque wrenches
    - Extensions
  - Torque to yield
  - Torque sequence
  - Torquing in steps
  
4. Repair damaged threads
  - Taps and wrenches
    - Taper
    - Plug
    - Bottoming
  - Drill and tap size charts
  - Tapping internal threads
  - Broken tap removal
  - Dies and stocks
  - Cutting external threads
  - Thread chasers
  - Helicoils
  
5. Select and use non threaded fasteners
  - Washers
    - Flat
    - Bevel
    - Lock
  - Pins
    - Cotter
    - clevis
    - Spring or roll
    - Shear
    - Taper
    - Dowel
  - Keys
    - Woodruff
    - Tapered
  - Splines
  - Locking plates
  - Safety wire
  - Snap rings
  - Rivets
  - Pop rivets





6. Remove damaged nuts, bolts or studs
  - Shaping a protruding end for grip
  - Broken stud extractors
  - Use of nut splitters
  - Use of chisels or punches
  - Use of hacksaws
  - Use of penetrating oil
  - Use of heat

**Achievement Criteria:**

Given a written and/or a practical assessment on Fasteners, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: C                      TOOLS AND EQUIPMENT**  
**Competency:              C - 5 Use Shop Tools and Equipment**

**Learning Objectives**      1. The learner will be able to select, use and maintain shop tools and equipment.

<b>Learning tasks</b>	<b>Content</b>
1. Select and use lifting and jacking equipment	<ul style="list-style-type: none"> <li>• Mechanical jacks</li> <li>• Hydraulic jacks</li> <li>• Transmission jacks</li> <li>• Hoists</li> <li>• Stands</li> <li>• Portable cranes</li> <li>• Care and inspection of lifting and blocking equipment</li> <li>• Creepers</li> </ul>
2. Select and use presses and pullers	<ul style="list-style-type: none"> <li>• Hydraulic presses and pullers</li> <li>• Arbor press</li> <li>• Slide hammers</li> <li>• Pullers               <ul style="list-style-type: none"> <li>- Bearing</li> <li>- Steering component</li> </ul> </li> </ul>
3. Maintain air compressors	<ul style="list-style-type: none"> <li>• Construction</li> <li>• Tank</li> <li>• Compressor</li> <li>• Motor / engine</li> <li>• Drives, belts, couplings</li> <li>• Water filter / traps</li> <li>• Lubricators</li> <li>• Pressure regulators</li> <li>• Piping and hoses</li> </ul>
4. Select and use cleaning equipment	<ul style="list-style-type: none"> <li>• Solvent and chemical cleaning facilities</li> <li>• Pressure washers</li> <li>• Steam cleaners</li> <li>• Abrasive blast machines</li> <li>• Brake cleaning equipment</li> </ul>



**Achievement Criteria:**

Given a written and/or a practical assessment on Shop Tools and Equipment, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: C TOOLS AND EQUIPMENT**  
**Competency: C – 6 Use Reference Resources**

**Learning Objectives** 1. The learner will be able to locate information from a variety of sources necessary to maintain, troubleshoot and service vehicles.

Learning tasks	Content
1. Use service manuals to locate information	<ul style="list-style-type: none"> <li>• Maintenance</li> <li>• Repair procedures</li> <li>• Torque requirements</li> <li>• Technical service bulletins</li> <li>• Vacuum diagrams</li> <li>• Wiring diagrams</li> </ul>
2. Use parts manuals to locate information	<ul style="list-style-type: none"> <li>• Exploded diagrams</li> <li>• Part number</li> <li>• Part quantity</li> <li>• Superseding of parts</li> <li>• Labour estimating guides</li> </ul>
3. Use computers to locate information	<ul style="list-style-type: none"> <li>• Vehicle Identification Number (VIN)</li> <li>• Vehicle identification information               <ul style="list-style-type: none"> <li>- Paint codes</li> <li>- Gross vehicle weight</li> <li>- Options</li> </ul> </li> <li>• Maintenance</li> <li>• Repair procedures</li> <li>• Torque requirements</li> <li>• Technical service bulletins</li> <li>• Vacuum diagrams</li> <li>• Wiring diagrams</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Reference Sources, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: C                      TOOLS AND EQUIPMENT**  
**Competency:              C - 7 Use Diagnostic Equipment**

- Learning Objectives**
1. The learner will be able to demonstrate the use of diagnostic equipment
  2. The learner will be able to interpret diagnostic information

<b>Learning tasks</b>	<b>Content</b>
1. Use mechanical diagnostic equipment	<ul style="list-style-type: none"> <li>• Gauges               <ul style="list-style-type: none"> <li>- Compression</li> <li>- Vacuum</li> <li>- Fuel pressure</li> <li>- Oil pressure</li> <li>- Leak down tester</li> <li>- Coolant tester</li> <li>- Tire pressure</li> <li>- Temperature</li> </ul> </li> <li>• Hydrometer</li> </ul>
2. Use electrical diagnostic equipment	<ul style="list-style-type: none"> <li>• Digital volt ohm meter (DVOM)               <ul style="list-style-type: none"> <li>- Units of measurement</li> <li>- Measure electrical signals</li> </ul> </li> <li>• Test light</li> <li>• Logic probe</li> <li>• High impedance test light</li> <li>• Analog / digital</li> <li>• Oscilloscope</li> <li>• Breakout box</li> <li>• AVR (charging systems)</li> <li>• Timing light</li> </ul>
3. Use scan tools	<ul style="list-style-type: none"> <li>• Scan tools               <ul style="list-style-type: none"> <li>- Describe generic and OEM scan tools</li> <li>- Types of codes</li> <li>- On board diagnostics</li> <li>- Data stream information</li> <li>- Code retrieval</li> <li>- Clearing fault codes</li> </ul> </li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Diagnostic Equipment, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: D                    GENERAL AUTOMOTIVE MAINTENANCE**  
**Competency:            D - 1   Select Lubricants and Fluids**

**Learning Objectives**      1. The learner will be able to select the correct lubricants and fluids necessary to maintain and service automobiles.

<b>Learning tasks</b>	<b>Content</b>
1. Describe and identify lubricants	<ul style="list-style-type: none"> <li>• Definition of friction</li> <li>• Function of oil in an engine</li> <li>• Synthetic and mineral oils</li> <li>• Oil classifications               <ul style="list-style-type: none"> <li>- SAE ratings</li> <li>- Viscosity index</li> <li>- Single and multi-viscosity</li> </ul> </li> <li>• Function of additives</li> <li>• Greases and other lubricants</li> <li>• Aerosols</li> </ul>
2. Describe and identify fluids	<ul style="list-style-type: none"> <li>• Replacement intervals</li> <li>• Antifreeze</li> <li>• Brake fluid</li> <li>• Drive axle fluids</li> <li>• Power steering fluid</li> <li>• Windshield washer fluid</li> </ul>
3. Describe and identify shop fluids	<ul style="list-style-type: none"> <li>• Engine shampoo</li> <li>• Floor cleaner</li> <li>• General cleaners</li> <li>• Solvent</li> <li>• Wheel acid</li> <li>• Car wash</li> </ul>
4. Select lubricants and fluids for specific purposes	<ul style="list-style-type: none"> <li>• Greases</li> <li>• Antifreeze</li> <li>• Brake fluid</li> <li>• Power steering fluid</li> <li>• Windshield washer fluid</li> <li>• Shop fluids</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Lubricants and Fluids, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: D**                      **GENERAL AUTOMOTIVE MAINTENANCE**  
**Competency:**            **D – 2 Perform Cooling System Maintenance**

- Learning Objectives**
1. The learner will be able to describe cooling system components and fluids
  2. The learner will be able to inspect cooling system condition and perform routine cooling system maintenance

<b>Learning tasks</b>	<b>Content</b>
1. Describe engine coolants	<ul style="list-style-type: none"> <li>• Ethylene glycol-based antifreeze</li> <li>• Propylene glycol-based antifreeze</li> <li>• Phosphate-free ethylene-glycol based antifreeze</li> <li>• Organic acid technology (OAT)</li> <li>• Hybrid organic acid technology (HOAT)</li> <li>• Chemical treatments and additives</li> <li>• Antifreeze / water proportions</li> <li>• Recycling</li> </ul>
2. Describe basic cooling system operation	<ul style="list-style-type: none"> <li>• Air cooled</li> <li>• Liquid cooled open-system</li> <li>• Liquid cooled closed system</li> </ul>
3. Describe and identify cooling system components	<ul style="list-style-type: none"> <li>• Radiator</li> <li>• Hoses</li> <li>• Clamps</li> <li>• Water pump</li> <li>• Thermostat</li> <li>• Heater core</li> <li>• Pressure cap</li> <li>• Expansion tank</li> <li>• Engine coolant passages</li> <li>• Cooling fans</li> <li>• Temperature sensors and indicators</li> </ul>
4. Test engine coolant	<ul style="list-style-type: none"> <li>• Hydrometer</li> <li>• Refractometer</li> <li>• Ph strips</li> <li>• Electrolysis inspection</li> <li>• Combustion gases</li> </ul>



5. Maintain cooling systems
  - Leak inspection and diagnosis
  - Drain and refill cooling system
  - Bleed cooling system
  - Flush cooling system
  - Test thermostat
  - Replace thermostat

**Achievement Criteria:**

Given a written and/or a practical assessment on Cooling System Maintenance, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.





**LINE: D**                      **GENERAL AUTOMOTIVE MAINTENANCE**  
**Competency: D- 3**    **Perform Exhaust System Maintenance**

**Learning Objectives**

1. The learner will be able to identify exhaust system components.
2. The learner will be able to diagnose exhaust systems.
3. The learner will be able to perform exhaust system maintenance.

<b>Learning tasks</b>	<b>Content</b>
1. Identify exhaust system components	<ul style="list-style-type: none"> <li>• Manifold and headers</li> <li>• Catalytic converter</li> <li>• Muffler and resonator</li> <li>• Piping and hardware</li> </ul>
2. Describe the design and operation of exhaust systems	<ul style="list-style-type: none"> <li>• Manifold and headers</li> <li>• Catalytic converter</li> <li>• Muffler and resonator</li> <li>• Piping and hardware</li> </ul>
3. Inspect and repair exhaust systems	<ul style="list-style-type: none"> <li>• Inspection               <ul style="list-style-type: none"> <li>- Visual</li> <li>- Audible</li> <li>- Smoke machine</li> </ul> </li> <li>• Thread repair</li> <li>• Component removal</li> <li>• Cutting procedures</li> <li>• Component installation</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Exhaust System Maintenance, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: D                      GENERAL AUTOMOTIVE MAINTENANCE**  
**Competency:              D – 4 Perform Transmission Maintenance**

- Learning Objectives**
1. The learner will be able to perform maintenance operations on manual transmissions and transaxles
  2. The learner will be able to perform maintenance operations on automatic transmissions and transaxles

<b>Learning tasks</b>	<b>Content</b>
1. Describe and identify transmission fluids	<ul style="list-style-type: none"> <li>• Gear oil</li> <li>• Engine oil</li> <li>• Manufacturer’s specific manual transmission fluids</li> <li>• Manufacturer’s specific automatic transmission fluids</li> </ul>
2. Maintain manual transmissions and transaxles	<ul style="list-style-type: none"> <li>• Fluid level inspection</li> <li>• Fluid selection</li> <li>• Leak diagnosis</li> <li>• Drain and refill</li> <li>• Linkage adjustment</li> </ul>
3. Maintain automatic transmissions and transaxles	<ul style="list-style-type: none"> <li>• Fluid level inspection</li> <li>• Fluid selection</li> <li>• Leak diagnosis</li> <li>• Drain and refill</li> <li>• Replace pan gasket and filter</li> <li>• Flush transmission fluid</li> <li>• Inspect shift linkage</li> <li>• Inspect throttle valve cable or linkage</li> <li>• Extract diagnostic codes using a scan tool</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Transmission Maintenance, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: D**                      **GENERAL AUTOMOTIVE MAINTENANCE**  
**Competency:**            **D - 5 Service Filters, Belts and Hoses**

- Learning Objectives**
1. The learner will be able to select the correct filters, belts and hoses to maintain and service automobiles
  2. The learner will be able to inspect, diagnose and replace filters, belts and hoses.
  3. The learner will be able to adjust belts

<b>Learning tasks</b>	<b>Content</b>
1. Describe and identify filters	<ul style="list-style-type: none"> <li>• Serviceable</li> <li>• Replaceable               <ul style="list-style-type: none"> <li>- Whole filter</li> <li>- Element</li> </ul> </li> <li>• Oil</li> <li>• Fuel</li> <li>• air</li> </ul>
2. Service filters	<ul style="list-style-type: none"> <li>• Oil</li> <li>• Fuel</li> <li>• Air</li> </ul>
3. Describe and identify drive belts	<ul style="list-style-type: none"> <li>• Nonmetallic               <ul style="list-style-type: none"> <li>- Vee</li> <li>- Serpentine</li> <li>- Gilmer (toothed)</li> </ul> </li> </ul>
4. Service drive belts	<ul style="list-style-type: none"> <li>• Diagnose wear and defects</li> <li>• Replacement</li> <li>• Tension adjustment</li> <li>• Pulley alignment</li> <li>• Bearings</li> <li>• Manufacturer's specifications</li> </ul>



5. Describe and identify hoses and clamps
  - Construction
    - Pressure
    - Vacuum
    - Reinforced
    - Material compatibility
    - Fuel
    - Oil
    - Coolant
    - Air / vacuum
    - Turbo
    - Brake
    - Flexibility
    - Moulded
  
6. Service hoses and clamps
  - Inspection
  - Replacement
  - Fuel
  - Oil
  - Coolant
  - Air / vacuum
  - Turbo
  - Brake
  
7. Perform routine maintenance
  - Lube, oil and filter service
  - Vehicle maintenance and inspection
  - Documentation
    - Checklist

**Achievement Criteria:**

Given a written and/or a practical assessment on Filters, Belts and Hoses, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: D**                      **GENERAL AUTOMOTIVE MAINTENANCE**  
**Competency:**              **D – 6 Replace Exterior Lamps**

- Learning Objectives**
1. The learner will be able to inspect and diagnose exterior lamp faults
  2. The learner will be able to select and install replacement exterior lamps

<b>Learning tasks</b>	<b>Content</b>
1. Describe exterior lamps	<ul style="list-style-type: none"> <li>• Headlights               <ul style="list-style-type: none"> <li>- Xenon</li> <li>- Halogen</li> <li>- Sealed beams</li> </ul> </li> <li>• Driving lights</li> <li>• Tail lights</li> <li>• Brake lights</li> <li>• Marker lights</li> <li>• Turn signals</li> <li>• License plate lights</li> <li>• Reverse lights</li> <li>• Government regulations</li> </ul>
2. Describe lamp integrity systems	<ul style="list-style-type: none"> <li>• Operation</li> <li>• reset</li> </ul>
3. Service exterior lamps	<ul style="list-style-type: none"> <li>• Aiming (headlights)</li> <li>• Handling procedures</li> <li>• Sealing</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Exterior Lamps, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: D**                      **GENERAL AUTOMOTIVE MAINTENANCE**  
**Competency:**            **D – 7 Service Body Trim, Hardware and Accessories**

- Learning Objectives**
1. The learner will be able to select and install accessories
  2. the learner will be able to inspect and repair body trim and hardware

<b>Learning tasks</b>	<b>Content</b>
<p>1. Describe the service of components of body, trim and accessories</p>	<ul style="list-style-type: none"> <li>• Power accessories</li> <li>• Windows</li> <li>• Mirrors</li> <li>• Bumpers</li> <li>• Moldings and trim</li> <li>• Doors</li> <li>• Door hardware</li> <li>• Body panels</li> <li>• Windshield wiper systems               <ul style="list-style-type: none"> <li>- Blades</li> <li>- Linkage</li> </ul> </li> <li>• Interior components               <ul style="list-style-type: none"> <li>- Seats</li> <li>- Carpet</li> <li>- Dashboard</li> <li>- Headliners</li> </ul> </li> </ul>
<p>2. Inspect and service body components</p>	<ul style="list-style-type: none"> <li>• Alignment</li> <li>• Lubricate seals</li> <li>• Inspection               <ul style="list-style-type: none"> <li>- Operation</li> <li>- NVH</li> <li>- Wind noise</li> <li>- Water leaks</li> <li>- Sealants</li> <li>- Mounting and hardware</li> <li>- Removal and installation of components</li> </ul> </li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Body Trim, Hardware and Accessories, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: D                      SUSPENSION SYSTEMS**  
**Competency:              D - 8 Service Tires and Wheels**

- Learning Objectives**
1. The learner will be able to select and install tires and wheels.
  2. The learner will be able to inspect tires and wheels for defects or damage.
  3. The learner will be able to repair tires.

<b>Learning tasks</b>	<b>Content</b>
1. Describe radial tire construction	<ul style="list-style-type: none"> <li>• Materials</li> <li>• Belts</li> <li>• Side walls</li> <li>• Sizing</li> <li>• Department of Transportation (DOT) number</li> <li>• Ratings               <ul style="list-style-type: none"> <li>- UTQG</li> <li>- Load</li> <li>- Pressure</li> </ul> </li> <li>• Tread design               <ul style="list-style-type: none"> <li>- Directional</li> <li>- Asymmetric</li> <li>- Conventional</li> </ul> </li> <li>• Temporary spare tire</li> </ul>
2. Service Tires	<ul style="list-style-type: none"> <li>• Inspection               <ul style="list-style-type: none"> <li>- Wear patterns</li> <li>- Damage</li> </ul> </li> <li>• Rotation</li> <li>• Mounting</li> <li>• Balance</li> <li>• Road force</li> <li>• Tire pressure monitoring systems               <ul style="list-style-type: none"> <li>- TPMS reset procedure</li> </ul> </li> </ul>
3. Repair tires	<ul style="list-style-type: none"> <li>• Rubber Manufacturer's Association Guidelines               <ul style="list-style-type: none"> <li>- Plug patches</li> <li>- Plugs</li> <li>- Patches</li> </ul> </li> <li>• Sealing tires</li> </ul>



4. Describe wheel construction
  - Alloy
  - Steel
  - Directional
  - Offset
  - Sizing
  - Bolt pattern
  - Flange design
  
5. Inspect wheels
  - Curb damage
  - Run out
  - Fatigue damage
  - Lug nut torque

**Achievement Criteria:**

Given a written and/or a practical assessment on Tire and Wheel Service, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.





**LINE: D                      SUSPENSION SYSTEMS**  
**Competency:              D– 9 Service Spindles and Hubs**

**Learning Objectives**

1. The learner will be able to identify spindles, hubs and related components.
2. The learner will be able to remove, replace and adjust spindles, hubs and related components.
3. The learner will be able to diagnose spindle and hub problems.

**Learning tasks**

**Content**

- |   |  |
|---|--|
| 1. Describe spindle and hub design and construction | <ul style="list-style-type: none"> <li>• Front wheel drive</li> <li>• Rear wheel drive</li> <li>• Construction materials</li> <li>• Bearing types</li> <li>• Disc or drum brake system</li> <li>• Four wheel drive hubs</li> <li>• Full floating axles</li> </ul>  |
| 2. Inspect and service spindles and hubs            | <ul style="list-style-type: none"> <li>• Lubrication               <ul style="list-style-type: none"> <li>- Inspection</li> <li>- Visual</li> <li>- Audible</li> </ul> </li> <li>• Measurements</li> <li>• Bearing adjustment</li> <li>• Alignment</li> <li>• Removal and installation</li> <li>• Axial and radial play</li> </ul> |

**Achievement Criteria:**

Given a written and/or a practical assessment on Spindle and Hub Service, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: E                    GENERAL AUTOMOTIVE PRACTICES**  
**Competency:            E – 1 Assess Leaks**

**Learning Objectives**     1. The learner will be able to locate leaks and determine causes and solutions

<b>Learning tasks</b>	<b>Content</b>
1. Describe leak detection methods	<ul style="list-style-type: none"> <li>• Visual</li> <li>• Audible</li> <li>• Black light</li> <li>• Fluid analysis</li> <li>• Pressurization / vacuum</li> <li>• Smoke generator</li> </ul>
2. Assess leak relevance	<ul style="list-style-type: none"> <li>• Cost of repair</li> <li>• Potential damage</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Assessing Leaks, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: E                    GENERAL AUTOMOTIVE PRACTICES**  
**Competency:            E - 2   Service Gaskets and Seals**

- Learning Objectives**
1. The learner will be able to identify causes of gasket and seal failure
  2. The learner will be able to select gaskets and seals
  3. The learner will be able to remove and replace gaskets and seals

<b>Learning tasks</b>	<b>Content</b>
1.    Describe gasket and seal construction	<ul style="list-style-type: none"> <li>• Gasket               <ul style="list-style-type: none"> <li>- Cylinder head gaskets</li> <li>- Other gaskets                   <ul style="list-style-type: none"> <li>- Rubber</li> <li>- Non-rubber</li> <li>- Reusable</li> <li>- Form in place</li> </ul> </li> </ul> </li> <li>• Sealers               <ul style="list-style-type: none"> <li>- Aerobic</li> <li>- Anaerobic</li> <li>- Sensor safe</li> </ul> </li> <li>• Seals               <ul style="list-style-type: none"> <li>- O-rings</li> <li>- Lip seals</li> </ul> </li> <li>• Sealing washers</li> </ul>
2.    Diagnose cause of failure	<ul style="list-style-type: none"> <li>• Incorrect assembly</li> <li>• Excessive heat</li> <li>• Over pressurization</li> <li>• Lack of lubrication</li> <li>• Seal deterioration</li> <li>• Mating surface damage</li> </ul>
3.    Service gaskets and seals	<ul style="list-style-type: none"> <li>• Removal techniques</li> <li>• Surface preparation</li> <li>• Installation techniques</li> <li>• Torque sequence</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Gasket and Seal Service, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: E**                      **GENERAL AUTOMOTIVE PRACTICES**  
**Competency: E – 3 Describe Diagnostic Procedures**

**Learning Objectives**

1. The learner will be able to describe the importance of following a diagnostic process.
2. The learner will be able to describe diagnostic procedures used for troubleshooting.

<b>Learning tasks</b>	<b>Content</b>
1. Describe the importance of following a diagnostic process	<ul style="list-style-type: none"> <li>• Cost of improper diagnosis</li> <li>• Unhappy customers</li> <li>• Lost business</li> <li>• Time management</li> <li>• Efficiency</li> <li>• Damage to components</li> </ul>
2. Describe general diagnostic procedures	<ul style="list-style-type: none"> <li>• Understand system</li> <li>• Understand complaint               <ul style="list-style-type: none"> <li>- Communicate with operator</li> <li>- Operational test</li> <li>- Visual inspection</li> </ul> </li> <li>• Form all possible conclusions</li> <li>• Test conclusions</li> <li>• System component isolation</li> </ul>
3. Describe the importance of following manufacturer’s diagnostic procedures where available	<ul style="list-style-type: none"> <li>• Time saving</li> <li>• Warranty requirement</li> <li>• Diagnosis may not be possible any other way</li> </ul>
4. Describe the importance of failure analysis	<ul style="list-style-type: none"> <li>• Repeat failure</li> <li>• Extended life</li> <li>• Cost</li> <li>• Customer satisfaction</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Diagnostic Procedures, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: E**                      **GENERAL AUTOMOTIVE PRACTICES**  
**Competency:**            **E – 4 Describe Fuel Delivery Systems**

- Learning Objectives**
1. The learner will be able to identify fuel delivery system components
  2. The learner will be able to describe the design and operation of fuel delivery systems

<b>Learning tasks</b>	<b>Content</b>
1. Identify components of fuel delivery systems	<ul style="list-style-type: none"> <li>• Fuel tank</li> <li>• Filler neck and cap</li> <li>• Roll-over valves</li> <li>• Fuel pumps and regulators</li> <li>• Filters and strainers</li> <li>• Fuel heaters</li> <li>• Water separators</li> <li>• Vapour recovery</li> <li>• Sensors and gauges</li> <li>• Gaskets and seals</li> <li>• Associated lines and fittings</li> </ul>
2. Describe the design and operation of fuel delivery systems	<ul style="list-style-type: none"> <li>• Fuel tank</li> <li>• Filler neck and cap</li> <li>• Roll-over valves</li> <li>• Fuel pumps and regulators</li> <li>• Filters and strainers</li> <li>• Fuel heaters</li> <li>• Water separators</li> <li>• Vapour recovery</li> <li>• Sensors and gauges</li> <li>• Construction materials</li> <li>• Associated lines and fittings</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Fuel Delivery Systems, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: E**                      **GENERAL AUTOMOTIVE PRACTICES**  
**Competency: E – 5 Describe Internal Combustion Engine Principles**

- Learning Objectives**
1. The learner will be able to identify internal combustion engine components
  2. The learner will be able to describe the design and operation of internal combustion engines

<b>Learning tasks</b>	<b>Content</b>
1. Describe internal combustion engine components	<ul style="list-style-type: none"> <li>• Short block assembly</li> <li>• Cylinder head assembly</li> <li>• Associated parts and fasteners</li> </ul>
2. Describe the design and operation of internal combustion engines	<ul style="list-style-type: none"> <li>• Fuel types</li> <li>• Two and four stroke cycle</li> <li>• Construction design and materials</li> <li>• Engine configurations</li> <li>• Cooling medium</li> <li>• Lubrication</li> <li>• Design variations               <ul style="list-style-type: none"> <li>- Miller cycle</li> <li>- Wankel</li> <li>- Variable valve timing</li> </ul> </li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Internal Engine Combustion Principles, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: E**                      **GENERAL AUTOMOTIVE PRACTICES**  
**Competency:**            **E – 6 Describe Vehicle Emissions**

- Learning Objectives**
1. The learner will be able to describe the principles of combustion
  2. The learner will be able to describe the byproducts of combustion
  3. The learner will be able to describe effects of byproducts of combustion on the environment

<b>Learning tasks</b>	<b>Content</b>
1. Describe the combustion process	<ul style="list-style-type: none"> <li>• Products of complete combustion</li> <li>• Products of incomplete combustion</li> </ul>
2. Describe causes of harmful vehicle emissions	<ul style="list-style-type: none"> <li>• Oxides of nitrogen</li> <li>• Hydrocarbons</li> <li>• Carbon monoxide</li> <li>• Carbon dioxide</li> <li>• Oxides of sulphur</li> <li>• Particulates</li> </ul>
3. Describe the effects of products of combustion on the environment	<ul style="list-style-type: none"> <li>• Oxides of nitrogen</li> <li>• Hydrocarbons</li> <li>• Carbon monoxide</li> <li>• Carbon dioxide</li> <li>• Oxides of sulphur</li> <li>• Particulates</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Vehicle Emissions, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: E**                      **GENERAL AUTOMOTIVE PRACTICES**  
**Competency:**            **E – 7 Demonstrate Welding Techniques**

- Learning Objectives**
1. The learner will be able to demonstrate welding safety procedures.
  2. The learner will be able to demonstrate basic welding and cutting.

<b>Learning tasks</b>	<b>Content</b>
1. Describe oxy-acetylene components	<ul style="list-style-type: none"> <li>• Safety</li> <li>• Gases</li> <li>• Tanks, regulators and hoses torches</li> </ul>
2. Demonstrate oxy-acetylene procedures	<ul style="list-style-type: none"> <li>• Set up</li> <li>• Lighting</li> <li>• Welding, cutting and brazing</li> <li>• Shut down</li> <li>• Storage</li> <li>• Maintenance</li> <li>• Inspection</li> </ul>
3. Describe MIG (GMAW) welding components and methods	<ul style="list-style-type: none"> <li>• Gas Metal Arc Welding (GMAW)</li> <li>• Safety</li> <li>• Gas</li> <li>• Tank, regulator and hose</li> <li>• Ground terminal</li> </ul>
4. Demonstrate MIG (GMAW) welding procedures	<ul style="list-style-type: none"> <li>• Set up</li> <li>• Weld</li> <li>• Shut down</li> <li>• Storage</li> <li>• Maintenance</li> <li>• Inspection</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Welding Techniques, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.





**LINE: F                      BRAKES SYSTEMS**  
**Competency:              F– 1    Service Tubing and Fittings**

- Learning Objectives**
1. The learner will be able to select tubing and fittings.
  2. The learner will be able to cut, bend and flare brake tubing.

<b>Learning tasks</b>	<b>Content</b>
1.    Select and use tubing and fittings	<ul style="list-style-type: none"> <li>• Tubing               <ul style="list-style-type: none"> <li>- Sizing</li> <li>- Material</li> <li>- Application</li> </ul> </li> <li>• Fittings               <ul style="list-style-type: none"> <li>- Flare</li> <li>- 45 degree</li> <li>- ISO</li> <li>- Quick disconnect couplers</li> </ul> </li> <li>• Cutting</li> <li>• Flaring               <ul style="list-style-type: none"> <li>- Double lap</li> <li>- SAE = 45 degree</li> <li>- ISO = bubble</li> </ul> </li> <li>• Bending</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Tubing and Fittings, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**Line: F**                      **Brakes Systems**  
**Competency: F – 2 Service Brake Hydraulic Systems**

- Learning Objectives**
1. The learner will be able to identify brake hydraulic system components.
  2. The learner will be able to remove and replace brake hydraulic system components.
  3. The learner will be able to diagnose causes of brake hydraulic system failure.

<b>Learning tasks</b>	<b>Content</b>
1. Describe hydraulic principles	<ul style="list-style-type: none"> <li>• Pascal’s law               <ul style="list-style-type: none"> <li>- Force</li> <li>- Pressure</li> <li>- Area</li> </ul> </li> </ul>
2. Describe components of the brake hydraulic system	<ul style="list-style-type: none"> <li>• Master cylinder</li> <li>• Wheel cylinder</li> <li>• Calipers</li> <li>• Valves               <ul style="list-style-type: none"> <li>- Residual pressure</li> <li>- Metering</li> <li>- Proportioning</li> <li>- Height sensing proportioning</li> <li>- Pressure differential</li> <li>- Combination</li> </ul> </li> <li>• Hoses</li> <li>• Hardware</li> <li>• Fluid</li> </ul>
3. Service the brake hydraulic system	<ul style="list-style-type: none"> <li>• Inspect</li> <li>• Diagnose</li> <li>• Repair / replace               <ul style="list-style-type: none"> <li>- Master cylinder</li> <li>- Wheel cylinder</li> <li>- Calipers</li> <li>- Valves</li> <li>- Hoses</li> <li>- Tubing</li> </ul> </li> <li>• Flush</li> <li>• Bleed               <ul style="list-style-type: none"> <li>- Pressure</li> <li>- Manual</li> <li>- Gravity</li> </ul> </li> </ul>



**Achievement Criteria:**

Given a written and/or a practical assessment on Brake Hydraulic Systems, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: F**                      **BRAKES SYSTEMS**  
**Competency: F - 3 Service Drum Brake Systems**

**Learning Objectives**

1. The learner will be able to identify drum brake system components.
2. The learner will be able to remove and replace and adjust drum brake system components.
3. The learner will be able to diagnose causes of drum brake system failure.

<b>Learning tasks</b>	<b>Content</b>
1. Describe friction principle	<ul style="list-style-type: none"> <li>• Coefficient of friction</li> <li>• Factors affecting friction               <ul style="list-style-type: none"> <li>- Material composition</li> <li>- Surface area</li> <li>- Heat</li> <li>- Applied pressure</li> </ul> </li> </ul>
2. Describe drum brake components	<ul style="list-style-type: none"> <li>• Drum</li> <li>• Shoes</li> <li>• Springs</li> <li>• Attaching hardware</li> <li>• Backing plate</li> <li>• Adjusters</li> <li>• Parking brake mechanism</li> <li>• Attaching hardware</li> <li>• Wheel cylinder</li> </ul>
3. Describe drum brake design and operation	<ul style="list-style-type: none"> <li>• Non energizing and self energizing</li> <li>• Parking</li> <li>• Full floating axles</li> </ul>
4. Inspect and overhaul drum brakes	<ul style="list-style-type: none"> <li>• Inspection               <ul style="list-style-type: none"> <li>- Measurement</li> <li>- Fluid leakage</li> <li>- Wheel seals</li> <li>- Hardware condition</li> <li>- Parking brake cable and mechanism</li> </ul> </li> <li>• Shoe replacement / adjustment</li> <li>• Drum service</li> <li>• Machining               <ul style="list-style-type: none"> <li>- On car</li> <li>- Off car</li> </ul> </li> <li>• Parking brake adjustment</li> <li>• Road test</li> </ul>



**Achievement Criteria:**

Given a written and/or a practical assessment on Drum Brake Systems, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: F                      BRAKES SYSTEMS**  
**Competency:              F - 4   Service Disc Brake Systems**

**Learning Objectives**

1. The learner will be able to identify disc brake system components.
2. The learner will be able to remove and replace and adjust disc brake system components.
3. The learner will be able to diagnose causes of disc brake system failure.

<b>Learning tasks</b>	<b>Content</b>
1. Describe friction principle	<ul style="list-style-type: none"> <li>• Coefficient of friction</li> <li>• Factors affecting friction               <ul style="list-style-type: none"> <li>- Material composition</li> <li>- Surface area</li> <li>- Heat</li> <li>- Applied pressure</li> </ul> </li> </ul>
2. Describe disc brake components	<ul style="list-style-type: none"> <li>• Rotor</li> <li>• Caliper</li> <li>• Pistons</li> <li>• Pads</li> <li>• Parking brake mechanism</li> </ul>
3. Describe disc brake design and operation	<ul style="list-style-type: none"> <li>• Rotor               <ul style="list-style-type: none"> <li>- Solid</li> <li>- Vented</li> <li>- Cross drilled</li> <li>- Grooved</li> </ul> </li> <li>• Caliper               <ul style="list-style-type: none"> <li>- Fixed</li> <li>- Floating</li> </ul> </li> <li>• Parking brake               <ul style="list-style-type: none"> <li>- Drum in hat</li> <li>- Caliper style</li> </ul> </li> <li>• Pads</li> </ul>



4. Inspect and overhaul disc brakes
  - Inspection
    - Measurement
    - Fluid leakage
    - Wheel seals
    - Hardware condition
    - Parking brake cable and mechanism
  - Pad replacement
  - Rotor service
    - Machining
      - On car
      - Off car
  - Parking brake adjustment
  - Road test

**Achievement Criteria:**

Given a written and/or a practical assessment on Disc Brake Systems, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: F                      BRAKES SYSTEMS**  
**Competency:              F - 5   Inspect Power Assist Systems**

- Learning Objectives**
1. The learner will be able to identify power assist system components.
  2. The learner will be able to diagnose causes of power assist system failure.

<b>Learning tasks</b>	<b>Content</b>
1. Describe the components of power assist systems	<ul style="list-style-type: none"> <li>• Hydraulic brake boosters               <ul style="list-style-type: none"> <li>- Power steering fluid</li> <li>- Brake fluid</li> </ul> </li> <li>• Vacuum booster layout</li> <li>• Common control valve designs</li> <li>• Vacuum pumps               <ul style="list-style-type: none"> <li>- Electrical</li> <li>- Mechanical</li> </ul> </li> </ul>
2. Describe the design and operation of power assist systems	<ul style="list-style-type: none"> <li>• Vacuum booster layout</li> <li>• Common control valve designs</li> <li>• Vacuum pumps               <ul style="list-style-type: none"> <li>- Electrical</li> <li>- Mechanical</li> </ul> </li> <li>• Emergency brake assist</li> </ul>
3. Inspect power assist systems	<ul style="list-style-type: none"> <li>• Test vacuum circuit</li> <li>• Test power assist function</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Power Assist Systems, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.





**LINE: F                      BRAKES SYSTEMS**  
**Competency:              F – 6 Service Anti-lock Brake Systems**

**Learning Objectives**

1. The learner will be able to identify anti-lock brake system components.
2. The learner will be able to remove, replace and adjust anti-lock brake system components.
3. The learner will be able to diagnose causes of power assist system failure.

<b>Learning tasks</b>	<b>Content</b>
1. Describe the benefits and limitations of anti-lock braking systems	<ul style="list-style-type: none"> <li>• History of ABS</li> <li>• Improved steering control while braking</li> <li>• Improved braking in most situations</li> <li>• Foundation for traction control</li> <li>• Foundation for dynamic stability control</li> </ul>
2. Describe the design and construction of anti-lock braking systems	<ul style="list-style-type: none"> <li>• Two wheel versus four wheel</li> <li>• One / three / four channel</li> <li>• Hydraulic               <ul style="list-style-type: none"> <li>- Pump</li> <li>- Valves</li> <li>- Accumulators</li> <li>- Fluid</li> </ul> </li> <li>• Electrical               <ul style="list-style-type: none"> <li>- Sensors</li> <li>- Computer</li> <li>- Controller</li> </ul> </li> <li>• Electronic brake force distribution</li> </ul>
3. Inspect and repair of anti-lock braking systems	<ul style="list-style-type: none"> <li>• safety</li> <li>• diagnostic fault codes</li> <li>• bleeding procedures</li> <li>• system self check</li> <li>• pinpoint procedures</li> <li>• speed sensor signal testing</li> <li>• Road testing</li> <li>• Component replacement</li> <li>• Diagnostic flow chart</li> </ul>



**Achievement Criteria:**

Given a written and/or a practical assessment on Anti-Lock Brake Systems, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: G                      STEERING SYSTEMS**  
**Competency:              G - 1 Service Steering Gears**

**Learning Objectives**

1. The learner will be able to identify steering gear components.
2. The learner will be able to remove, replace and adjust steering gears.
3. The learner will be able to diagnose causes of steering gear failure.

<b>Learning tasks</b>	<b>Content</b>
1. Describe the components of conventional steering gears	<ul style="list-style-type: none"> <li>• Re-circulating ball steering box design               <ul style="list-style-type: none"> <li>- Ball nut assembly</li> <li>- Sector shaft</li> <li>- Thrust bearings</li> <li>- Seals</li> <li>- Lubrication</li> </ul> </li> </ul>
2. Describe the design and construction of conventional steering gears	<ul style="list-style-type: none"> <li>• Steering box ratio</li> <li>• Materials</li> <li>• Mounting</li> </ul>
3. Service conventional steering gears	<ul style="list-style-type: none"> <li>• Seal leakage</li> <li>• Shaft wear</li> <li>• Gear tooth wear</li> <li>• Pitman arm spline wear or damage</li> <li>• Sequence of adjustments               <ul style="list-style-type: none"> <li>- Bearing preload</li> <li>- Gear tooth lash</li> <li>- Over centre adjustment</li> </ul> </li> </ul>
4. Describe the components of rack and pinion steering gears	<ul style="list-style-type: none"> <li>• Housing and seals</li> <li>• Rack and pinion</li> <li>• Bearings</li> <li>• Tie rod ends</li> <li>• Bellows (boots)</li> </ul>
5. Describe the design and operation of rack and pinion steering gears	<ul style="list-style-type: none"> <li>• Steering gear ratio</li> <li>• Materials</li> <li>• Lubrication</li> <li>• Mounting</li> </ul>



6. Service rack and pinion steering gears
  - Tie rod ends
  - Pinion shaft and bearing wear
  - Leaks
  - Mounting
  - Condition of bellows
  - Wheel alignment

**Achievement Criteria:**

Given a written and/or a practical assessment on Steering Gears, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: G                      ELECTRICAL/ELECTRONIC SYSTEMS**  
**Competency:              G – 2 Service Passenger Restraint Systems**

**Learning Objectives**

1. The learner will be able to identify passenger restraint system components.
2. The learner will be able to safely disarm and rearm passenger restraint systems.
3. The learner will be able to remove and replace passenger restraint system components.

<b>Learning tasks</b>	<b>Content</b>
1. Describe passenger restraint systems	<ul style="list-style-type: none"> <li>• Regulations</li> <li>• Construction               <ul style="list-style-type: none"> <li>- gas generating</li> <li>- compressed gas</li> </ul> </li> <li>• Passive               <ul style="list-style-type: none"> <li>- Air bags</li> <li>- Shoulder belts</li> <li>- Whiplash protection</li> <li>- Side impact</li> <li>- Passenger detection</li> <li>- Crash avoidance</li> </ul> </li> <li>• Active               <ul style="list-style-type: none"> <li>- Pyrotechnic pretensioners</li> </ul> </li> </ul>
2. Disarm and rearm air bag system	<ul style="list-style-type: none"> <li>• Safety</li> <li>• Diagnostic codes</li> <li>• Visual inspection</li> <li>• Functional testing</li> <li>• Repair / replacement procedures               <ul style="list-style-type: none"> <li>- Centre clock spring</li> </ul> </li> <li>• Liability</li> <li>• Tampering</li> <li>• System disabling</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Passenger Restraint Systems, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: G                      STEERING SYSTEMS**  
**Competency:              G – 3 Service Steering Columns**

**Learning Objectives**

1. The learner will be able to identify steering columns and related components.
2. The learner will be able to describe the removal, replacement and adjustment of steering columns and related components.
3. The learner will be able to diagnose causes of steering column and related component failure.

**Learning tasks**

**Content**

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. Describe the components of steering columns</li> </ol>                 | <ul style="list-style-type: none"> <li>• Mounting</li> <li>• Bearings</li> <li>• Coupling assemblies</li> <li>• Collapsing function</li> <li>• Dust seals</li> <li>• Steering wheel security systems</li> <li>• Master splines for steering wheel</li> <li>• Noise suppression and sealing</li> <li>• Air bag precautions and procedures</li> </ul> |
| <ol style="list-style-type: none"> <li>2. Describe the design and construction of steering columns</li> </ol>    | <ul style="list-style-type: none"> <li>• Tilting and telescoping function</li> <li>• Collapsing function</li> <li>• Noise transmission</li> <li>• Vibration suppression</li> <li>• Supplementary restraint systems (SRS)</li> <li>• Shift linkage</li> </ul>  |
| <ol style="list-style-type: none"> <li>3. Describe the inspection and replacement of steering columns</li> </ol> | <ul style="list-style-type: none"> <li>• SRS safety awareness</li> <li>• Steering wheel alignment</li> <li>• Alignment for noise and vibration</li> <li>• Electrical connections</li> <li>• Mounting procedures and hardware</li> <li>• Shift linkage adjustment</li> <li>• Collapsing feature</li> </ul>   |

**Achievement Criteria:**

Given a written and/or a practical assessment on Steering Columns, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: G                      STEERING SYSTEMS**  
**Competency:              G - 4 Service Steering Linkage**

**Learning Objectives**

1. The learner will be able to identify steering linkage components.
2. The learner will be able to remove, replace and adjust steering linkage components.
3. The learner will be able to diagnose steering linkage wear or damage.

<b>Learning tasks</b>	<b>Content</b>
1. Describe the components of steering linkage	<ul style="list-style-type: none"> <li>• Tie rod ends and sockets</li> <li>• Pitman arm</li> <li>• Idler arm</li> <li>• Centre (drag) link</li> <li>• Associated hardware</li> </ul>
2. Describe the design and construction of steering linkage	<ul style="list-style-type: none"> <li>• Parallelogram linkage</li> <li>• Haltenberger</li> </ul>
3. Inspect and repair steering linkage	<ul style="list-style-type: none"> <li>• Wear               <ul style="list-style-type: none"> <li>- Ball joint play</li> <li>- Axial</li> <li>- Radial</li> </ul> </li> <li>• Idler arm</li> <li>• Tie rods</li> <li>• Pitman arm</li> <li>• Center link</li> <li>• Steering knuckle</li> <li>• Lubrication and boot condition</li> <li>• Tie rod and clamp alignment</li> <li>• Torque of hardware</li> <li>• Cotter pin of castellated nuts</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Steering Linkage, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: G                      STEERING SYSTEMS**  
**Competency:              G - 5 Service Power Steering Systems**

**Learning Objectives**

1. The learner will be able to identify power steering system components.
2. The learner will be able to remove, replace and adjust power steering system components.
3. The learner will be able to diagnose causes of power steering system problems.

<b>Learning tasks</b>	<b>Content</b>
1. Describe the components of a power steering system	<ul style="list-style-type: none"> <li>• Pump</li> <li>• Associated hoses</li> <li>• Spool valve</li> <li>• Power cylinder</li> <li>• Fluid types</li> </ul>
2. Describe the design and construction of a power steering system	<ul style="list-style-type: none"> <li>• Pump pressure and flow regulation</li> <li>• Spool valve operation</li> <li>• Power cylinder operation</li> <li>• Speed control and variable assist</li> <li>• Electric power steering</li> </ul>
3. Inspect and repair power steering systems	<ul style="list-style-type: none"> <li>• Fluid level and condition</li> <li>• Leaks               <ul style="list-style-type: none"> <li>- Internal</li> <li>- External</li> </ul> </li> <li>• Pump replacement</li> <li>• Pump mounting and belt adjustment</li> <li>• Pressure and flow testing</li> <li>• Bleeding</li> <li>• Road test</li> <li>• Turning effort test</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Power Steering Systems, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.





**LINE: G                      STEERING SYSTEMS**  
**Competency:              G - 6 Perform Wheel Alignments**

- Learning Objectives**
1. The learner will be able to describe wheel alignment angles.
  2. The learner will be able to measure and adjust wheel alignment angles.
  3. The learner will be able to diagnose wheel alignment problems.

<b>Learning tasks</b>	<b>Content</b>
1. Describe steering geometry	<ul style="list-style-type: none"> <li>• Caster</li> <li>• Camber</li> <li>• Toe</li> <li>• Steering axis inclination</li> <li>• Scrub radius</li> <li>• Toe out on turns</li> <li>• Thrust angle</li> <li>• Two wheel versus four wheel alignment</li> <li>• Collision damage</li> </ul>
2. Describe methods of adjusting steering geometry	<ul style="list-style-type: none"> <li>• Pre-checks</li> <li>• Factory adjustment methods</li> <li>• Aftermarket adjustment methods</li> </ul>
3. Adjust wheel alignment	<ul style="list-style-type: none"> <li>• Four wheel alignment procedures</li> <li>• Rear wheels               <ul style="list-style-type: none"> <li>- Thrust angle</li> <li>- camber</li> <li>- Toe</li> </ul> </li> <li>• Front wheels               <ul style="list-style-type: none"> <li>- Camber</li> <li>- Caster</li> <li>- Toe</li> </ul> </li> <li>• Check toe out on turns</li> <li>• Check steering axis inclination</li> <li>• Check steering wheel centre</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Wheel Alignments, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: G                      STEERING SYSTEMS**  
**Competency:              G – 7 Describe Four Wheel Steering Systems**

- Learning Objectives**
1. The learner will be able to identify four-wheel steering system components
  2. The learner will be able to describe the operation of four-wheel steering systems

<b>Learning tasks</b>	<b>Content</b>
1. Describe the design and operation of four-wheel steering systems	<ul style="list-style-type: none"> <li>• Overview               <ul style="list-style-type: none"> <li>- Electrical systems</li> <li>- Mechanical systems</li> </ul> </li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Four Wheel Steering Systems, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: H                      SUSPENSION SYSTEMS**  
**Competency:              H - 1    Service Bearings and Bushings**

- Learning Objectives**
1. The learner will be able to select bearings and bushings
  2. The learner will be able to remove and replace bearings and bushings
  3. The learner will be able to identify causes of bearing and bushing failure

<b>Learning tasks</b>	<b>Content</b>
1.    Describe non-friction bearings	<ul style="list-style-type: none"> <li>• Conrad (ball) bearing</li> <li>• Tapered roller bearing</li> <li>• Needle bearing</li> <li>• Ball thrust bearing</li> <li>• Dimensions</li> <li>• Load capacity</li> </ul>
2.    Service non-friction bearings	<ul style="list-style-type: none"> <li>• Cause of failure</li> <li>• Removal and installation techniques</li> <li>• Lubrication / repacking               <ul style="list-style-type: none"> <li>- Cleaning</li> </ul> </li> <li>• Selection</li> <li>• Adjustment</li> <li>• Axial and radial play</li> </ul>
3.    Describe friction bearings (bushings)	<ul style="list-style-type: none"> <li>• Construction and design</li> <li>• Lubrication</li> </ul>
4.    Service friction bearings	<ul style="list-style-type: none"> <li>• Cause of failure</li> <li>• Removal and installation techniques</li> <li>• Lubrication               <ul style="list-style-type: none"> <li>- Cleaning</li> </ul> </li> <li>• Selection</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Bearing and Bushing Service, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: H                      SUSPENSION SYSTEMS**  
**Competency:                H – 2 Describe Frame Types**

**Learning Objectives**

1. The learner will be able to identify frame types.
2. The learner will be able to describe the advantages and disadvantages of unit body and conventional frame designs.

<b>Learning tasks</b>	<b>Content</b>
1. Identify frame designs and construction	<ul style="list-style-type: none"> <li>• Unit body</li> <li>• Conventional body over frame               <ul style="list-style-type: none"> <li>- Perimeter</li> <li>- Ladder</li> </ul> </li> <li>• Welded construction</li> <li>• Rivet construction</li> <li>• Hydro-forming</li> <li>• Material selection</li> <li>• Strength</li> <li>• Accident crush zones</li> </ul>
2. Compare frame types	<ul style="list-style-type: none"> <li>• Advantages</li> <li>• Disadvantages</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Frame Types, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: H                      SUSPENSION SYSTEMS**  
**Competency:                H - 3 Describe Suspension Systems**

- Learning Objectives**
1. The learner will be able to describe the design and operation of suspension systems.
  2. The learner will be able to describe the forces acting upon a suspension system.

<b>Learning tasks</b>	<b>Content</b>
1. Describe suspension types	<ul style="list-style-type: none"> <li>• Front               <ul style="list-style-type: none"> <li>- Rigid</li> <li>- Independent                   <ul style="list-style-type: none"> <li>- McPherson strut</li> <li>- Short and long arm</li> <li>- Multi link</li> <li>- Twin I beam</li> </ul> </li> </ul> </li> <li>• Rear               <ul style="list-style-type: none"> <li>- Rigid</li> <li>- Independent                   <ul style="list-style-type: none"> <li>- Chapman strut</li> <li>- Short and long arm</li> <li>- Multi link</li> <li>- Semi - rigid</li> </ul> </li> </ul> </li> </ul>
2. Describe suspension dynamics	<ul style="list-style-type: none"> <li>• Forces               <ul style="list-style-type: none"> <li>- Lateral</li> <li>- Acceleration</li> <li>- Braking</li> </ul> </li> <li>• Body roll</li> <li>• Suspension travel</li> <li>• Weight shifting</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Suspension Systems, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: H                      SUSPENSION SYSTEMS**  
**Competency:                H - 4 Describe Electronic Suspension Systems**

**Learning Objectives**

1. The learner will be able to identify electronic suspension system components.
2. The learner will be able to describe the removal, replacement and adjustment of electronic suspension system components.

<b>Learning tasks</b>	<b>Content</b>
1. Describe electronic suspension systems	<ul style="list-style-type: none"> <li>• Basic</li> <li>• Electrically controlled shocks</li> <li>• Load leveling system</li> <li>• Advanced</li> <li>• Air springs / struts</li> <li>• Electronic / computer controlled dynamic systems</li> </ul>
2. Describe the inspection and repair of electronic suspension systems	<ul style="list-style-type: none"> <li>• Safety</li> <li>• Visual inspection</li> <li>• Function test</li> <li>• Electrical test</li> <li>• Diagnostic codes</li> <li>• Removal and replacement</li> <li>• Alignment</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Electronic Suspension Systems, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: H                      SUSPENSION SYSTEMS**  
**Competency:                H - 5 Service Spring Types**

- Learning Objectives**
1. The learner will be able to identify springs and related components
  2. The learner will be able to diagnose spring problems
  3. The learner will be able to remove, replace and adjust springs and related components

<b>Learning tasks</b>	<b>Content</b>
1. Describe common automotive spring designs	<ul style="list-style-type: none"> <li>• Coil</li> <li>• Leaf               <ul style="list-style-type: none"> <li>- Materials</li> </ul> </li> <li>• Mono leaf</li> <li>• Air</li> <li>• Torsion bar</li> <li>• Anti sway bar</li> <li>• Modification               <ul style="list-style-type: none"> <li>- Ride height</li> <li>- Towing</li> <li>- Off road</li> <li>- Performance</li> </ul> </li> </ul>
2. Inspect and service common automotive springs	<ul style="list-style-type: none"> <li>• Ride height measurements</li> <li>• Damaged / worn components</li> <li>• Safety               <ul style="list-style-type: none"> <li>- Unloading springs</li> <li>- Compressing springs</li> </ul> </li> <li>• Functional test</li> <li>• Removal and replacement</li> <li>• Torquing sequence and procedures</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Spring Types, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: H                      SUSPENSION SYSTEMS**  
**Competency:              H - 6 Service Suspension Components**

**Learning Objectives**

1. The learner will be able to identify suspension system components
2. The learner will be able to remove, replace and adjust suspension system types.
3. The learner will be able to diagnose suspension system problems.

**Learning tasks**

**Content**

1. Describe vehicle suspension component design and construction

- Ball joints
- King pins
- Control arms
  - Loaded
  - Follower
- Locating arms
- Rubber bushings
- Frame and body mounting points
- Construction materials

2. Inspect and service vehicle suspension components

- Safety
- Unloading springs
- Compressing springs
- Lubrication
- Visual inspection
- Damaged / worn components
- Measurements
- Removal and replacement
- Torquing sequence and procedure

**Achievement Criteria:**

Given a written and/or a practical assessment on Suspension Components, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.





**LINE: H                      SUSPENSION SYSTEMS**  
**Competency:              H - 7   Service Shocks and Struts**

- Learning Objectives**
1. The learner will be able to identify shock and strut components
  2. The learner will be able to diagnose shock and strut problems
  3. The learner will be able to remove, replace and adjust shocks and struts

<b>Learning tasks</b>	<b>Content</b>
1. Describe the construction and operation of shock absorbers and struts	<ul style="list-style-type: none"> <li>• Purpose</li> <li>• Components</li> <li>• Types               <ul style="list-style-type: none"> <li>- Conventional</li> <li>- Gas                   <ul style="list-style-type: none"> <li>- Low pressure</li> <li>- High pressure</li> </ul> </li> </ul> </li> <li>• Adjustable               <ul style="list-style-type: none"> <li>- Mechanical</li> <li>- Electrical</li> <li>- Pneumatic</li> </ul> </li> <li>• Modification               <ul style="list-style-type: none"> <li>- Towing</li> <li>- Off road</li> <li>- Performance</li> </ul> </li> </ul>
2. Inspect and service shock absorbers and struts	<ul style="list-style-type: none"> <li>• Visual inspection</li> <li>• Functional test</li> <li>• Bounce and rebound test</li> <li>• Leaks</li> <li>• Corrosion</li> <li>• Safety</li> <li>• Removal and replacement</li> <li>• Alignment</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Shock and Strut Service, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: I**                      **BASIC ELECTRICAL SYSTEMS**  
**Competency: I-1**    **Describe Principles of Electricity**

**Learning Objectives**

1. The learner will be able to describe the principles of electricity and magnetism.
2. The learner will be able to describe circuit components and their operation.
3. The learner will be able to describe the use of electrical test equipment.

<b>Learning tasks</b>	<b>Content</b>
1. Define electrical terminology	<ul style="list-style-type: none"> <li>• Electrical quantities and their units and prefixes               <ul style="list-style-type: none"> <li>- Voltage</li> <li>- Current</li> <li>- Resistance</li> <li>- Power</li> </ul> </li> <li>• Types of circuits               <ul style="list-style-type: none"> <li>- Series circuit</li> <li>- Parallel circuit</li> <li>- Series parallel circuit</li> </ul> </li> <li>• Circuit terminology               <ul style="list-style-type: none"> <li>- Open circuit</li> <li>- Closed circuit</li> <li>- Short circuit</li> <li>- Continuity</li> <li>- Ground</li> <li>- Ground fault</li> <li>- Duty cycle</li> <li>- Pulse width modulation</li> </ul> </li> </ul>
2. Explain basic circuit concepts	<ul style="list-style-type: none"> <li>• Electron theory</li> <li>• Conventional theory</li> <li>• Basic circuit construction               <ul style="list-style-type: none"> <li>- Power source</li> <li>- Load</li> <li>- control</li> <li>- Complete path</li> </ul> </li> <li>• Electrical relationships               <ul style="list-style-type: none"> <li>- Ohm's law</li> <li>- Watts law</li> <li>- Series circuits</li> <li>- Parallel circuits</li> <li>- Series parallel circuits</li> </ul> </li> </ul>



3. Describe electrical components and their purpose
  - Wire
  - Devices
  - Protective devices
    - Actuators
    - Resistors
    - Switches
    - Conductors
    - Insulators
  
4. Describe magnetic theory
  - Properties of magnetic lines of force
  - Terminology
    - Flux
    - Flux density
    - Reluctance
    - Permeability
  - Relationship to electrical current
    - Left hand rule for conductors
    - Left hand rule for coils
    - Electromagnetic induction
    - Relative motion
    - Speed
    - Angle
  - Effect of magnetic core on coils
  - Signal interference

**Achievement Criteria:**

Given a written and/or a practical assessment on Principles of Electricity, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: I**                      **BASIC ELECTRICAL SYSTEMS**  
**Competency: I - 2 Describe Principles of Electronics**

- Learning Objectives**
1. The learner will be able to describe the principles of electronics.
  2. The learner will be able to describe electronic circuit components and their operation.

<b>Learning tasks</b>	<b>Content</b>
1. Describe semiconductor theory	<ul style="list-style-type: none"> <li>• Semiconductor doping</li> <li>• PN junction</li> <li>• PNP and NPN junctions</li> </ul>
2. Describe electronic components	<ul style="list-style-type: none"> <li>• Diodes</li> <li>• Zener diodes</li> <li>• Light emitting diodes</li> <li>• Capacitors</li> <li>• Transistors</li> <li>• Silicon controlled rectifier</li> <li>• Analog to digital converter</li> <li>• Digital to analog converter</li> <li>• Rom and Ram</li> <li>• Transducers</li> </ul>
3. Describe microprocessor systems	<ul style="list-style-type: none"> <li>• Microprocessor</li> <li>• Inputs / outputs</li> <li>• Programs</li> <li>• Local area networks (LAN)</li> </ul>
4. Describe electronic shielding	<ul style="list-style-type: none"> <li>• Electromagnetic interference</li> <li>• Interference prevention               <ul style="list-style-type: none"> <li>- Shielding</li> <li>- Routing</li> <li>- Twisted pair</li> <li>- Termination</li> <li>- Fibre optics</li> </ul> </li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Principles of Electronics, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: I                      BASIC ELECTRICAL SYSTEMS**  
**Competency:            I - 3    Service Wiring Harnesses**

**Learning Objectives**

1. The learner will be able to interpret wiring diagrams and symbols.
2. The learner will be able to diagnose wiring harness problems.
3. The learner will be able to repair or remove and replace wiring harnesses.

<b>Learning tasks</b>	<b>Content</b>
1. Describe wiring harnesses	<ul style="list-style-type: none"> <li>• Purpose</li> <li>• Shielding</li> <li>• Routing</li> <li>• Support</li> <li>• Wire               <ul style="list-style-type: none"> <li>- Gauge</li> <li>- Identification</li> <li>- Composition</li> <li>- Connectors</li> <li>- Twisted pairs</li> </ul> </li> </ul>
2. Interpret electrical wiring diagrams	<ul style="list-style-type: none"> <li>• Symbols</li> <li>• Conventions</li> <li>• Abbreviations</li> <li>• Power flow</li> <li>• Connectors</li> </ul>
3. Inspect and repair wiring harnesses	<ul style="list-style-type: none"> <li>• Visual inspection</li> <li>• Connectors</li> <li>• Soldering</li> <li>• Crimping</li> <li>• Insulation</li> <li>• Supports</li> <li>• Removal and installation</li> <li>• Testing</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Wiring Harness Service, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: I                      BASIC ELECTRICAL SYSTEMS**  
**Competency:            I - 4    Service Batteries**

**Learning Objectives**

1. The learner will be able to describe battery design and operation.
2. The learner will be able to select, test and maintain batteries.
3. The learner will be able to diagnose causes of battery failure.
4. The learner will be able to remove and replace batteries.

<b>Learning tasks</b>	<b>Content</b>
1. Describe safety considerations when working with automotive batteries	<ul style="list-style-type: none"> <li>• Hydrogen gassing</li> <li>• Acid</li> <li>• Personal protective equipment</li> <li>• Frozen batteries</li> <li>• Short circuit capacity</li> <li>• Environmental considerations</li> </ul>
2. Describe the design and construction of a lead acid battery	<ul style="list-style-type: none"> <li>• Plates</li> <li>• Plate straps</li> <li>• Separators</li> <li>• Electrolyte</li> <li>• Case</li> <li>• Terminals</li> </ul>
3. Describe the chemical action that takes place in a lead acid battery during charging and discharging	<ul style="list-style-type: none"> <li>• Charging cycle</li> <li>• Discharging cycle</li> </ul>
4. Describe the various types of automotive batteries	<ul style="list-style-type: none"> <li>• Low maintenance</li> <li>• Maintenance free</li> <li>• Deep cycle</li> <li>• Recombination</li> <li>• Gel cell</li> </ul>
5. Select automotive batteries	<ul style="list-style-type: none"> <li>• Battery rating methods</li> <li>• Physical dimensions</li> </ul>
6. Inspect and service automotive batteries	<ul style="list-style-type: none"> <li>• Factors affecting the life cycle of batteries</li> <li>• Inspection</li> <li>• Cleaning</li> <li>• Terminal servicing</li> <li>• Charging</li> <li>• Testing</li> <li>• Replacement</li> </ul>



**Achievement Criteria:**

Given a written and/or a practical assessment on Battery Service, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



**LINE: I                      BASIC ELECTRICAL SYSTEMS**  
**Competency:            I - 5    Describe Engine Management Systems**

- Learning Objectives**
1. The learner will be able to describe the function of engine management systems
  2. The learner will be able to identify the components of engine management systems

<b>Learning tasks</b>	<b>Content</b>
1. Describe the purpose of engine management systems	<ul style="list-style-type: none"> <li>● Monitoring and controlling               <ul style="list-style-type: none"> <li>- Emissions</li> <li>- Fuel economy</li> <li>- Driveability</li> <li>- Warranty date collection</li> <li>- Troubleshooting</li> </ul> </li> </ul>
2. Identify onboard diagnostic systems	<ul style="list-style-type: none"> <li>● OBD</li> <li>● OBD II</li> </ul>
3. Identify the components of engine management systems	<ul style="list-style-type: none"> <li>● Microprocessor</li> <li>● Software</li> <li>● Inputs</li> <li>● Outputs</li> <li>● Wiring and connectors</li> <li>● Diagnostic connections</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Engine Management Systems, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.





**LINE: I                      BASIC ELECTRICAL SYSTEMS**  
**Competency:            I - 6    Describe Ignition Systems**

- Learning Objectives**
1. The learner will be able to identify ignition system components
  2. The learner will be able to describe the design and operation of electronic ignition systems

<b>Learning tasks</b>	<b>Content</b>
1. Identify the components of electronic ignition systems	<ul style="list-style-type: none"> <li>• Battery</li> <li>• Ignition switch and wiring</li> <li>• Trigger device (s)</li> <li>• Sensors</li> <li>• Computer</li> <li>• Distributor type               <ul style="list-style-type: none"> <li>- Rotor</li> <li>- Cap</li> <li>- Advance / retard mechanisms</li> </ul> </li> <li>• Ignition coil (s)</li> <li>• High tension wires</li> <li>• Spark plugs</li> </ul>
2. Describe the design and operation of electronic ignition systems	<ul style="list-style-type: none"> <li>• Purpose of ignition system</li> <li>• Primary and secondary circuit</li> <li>• Waste spark</li> <li>• Variable / fixed dwell systems</li> <li>• Timing</li> <li>• Ignition switch and wiring</li> <li>• Trigger device (s)</li> <li>• Sensors</li> <li>• Computer</li> <li>• Distributor type</li> <li>• Distributor-less (direct)</li> <li>• Ignition coil (s)</li> <li>• High tension wires</li> <li>• Spark plugs</li> </ul>

**Achievement Criteria:**

Given a written and/or a practical assessment on Ignition Systems, the Learner will be able to demonstrate knowledge of the trade by achieving 70% or better based on a summative total of Instructor assessment.



# **SECTION 3**

## **FACILITY REQUIREMENTS**



## INSTRUCTOR REQUIREMENTS

### Trade Qualification

- Automotive Service Technician with an Inter-provincial “Red Seal” endorsement

### Work Experience

- Must have a minimum of 5 years experience as a journeyperson
- Must have diverse industry experience including that which would cover all the competencies in this level

### Training Qualifications

- Instructors Certificate (minimum 30hr course)
- Instructors must have or be registered in an Instructor’s Diploma Program, to be completed within a five year period.
- Or, hold a Bachelors or Masters degree in Education.



## FACILITY REQUIREMENTS

### CLASSROOM AREA

- Comfortable seating and tables suitable for training, teaching, lecturing
- Compliance with all local and national fire code and occupational safety requirements
- Lighting controls to allow easy visibility of projection screen while also allowing students to take notes
- Windows must have shades or blinds to adjust sunlight
- Heating / Air conditioning for comfort all year round
- In-room temperature regulation to ensure comfortable room temperature
- In-room ventilation sufficient to control training room temperature
- Acoustics in the room must allow audibility of the instructor
- White marking board with pens and eraser (optional: flipchart in similar size)
- Projection screen or projection area at front of classroom
- Overhead projector and/or multi-media projector

### SHOP AREA (fixed properties)

- Ceiling shall be a minimum height of 16' or as varied by good engineering practices and code
- Appropriate lifting devices (hoists) used in industry
- Suitable demonstration area
- Lighting appropriate for good vision in ambient light
- Compliance with all local and national fire code and occupational safety requirements
- Must meet Municipal and Provincial bylaws in regards to waste water management and environmental laws
- Adequate hoist to student ratio



## **TOOLS AND EQUIPMENT LIST - AUTOMOTIVE SERVICE TECHNICIAN PROGRAM OUTLINE– FOUNDATION LEVEL**

### **Standard Tools**

1. air drills / tools
2. air hammer / chisel
3. air ratchet
4. antifreeze tester
5. axle boot clamp tool
6. battery post service and reshape tool
7. belt tension release tool
8. blow gun
9. bolt extractor set (easy outs)
10. brake service tools (adjusters, spring removal, installation and caliper tools)
11. caulking gun
12. centre punch
13. chisels, punches
14. compression tester
15. creeper / fender covers
16. crowfoot wrenches (flare and std, SAE and Metric)
17. dial indicator set (flare and std, SAE and Metric)
18. die grinder
19. drill and bits
20. drill gauge
21. feeler gauges – SAE and metric
22. files – bastard cut/half round/mill cut/square and thread file
23. filter wrenches
24. flare nut wrenches (SAE and metric)
25. flaring tool (SAE, metric and ISO)
26. flash lights
27. fuel line disconnect set
28. hacksaw
29. hammers – ball peen / dead blow / rubber
30. mallet / soft face
31. hex keys – SAE and metric
32. impact driver and bits
33. impact wrench and impact socket set – SAE and metric
34. inspection mirror
35. jumper lead
36. magnetic pick up tool
37. mechanic's pick set
38. multi-meter (DVOM)
39. nut driver set – SAE and metric
40. pipe cutter(exhaust)
41. pipe expander(exhaust)



42. pliers – slip joint, needle nose, adjustable, wheel weight,
43. side cutter, snap ring, locking, hog ring and battery types
44. pry bar
45. pullers – gear, pulley, battery terminal and steering wheel
46. ratchet and sockets – ¼, 3/8 and ½ drive
47. SAE and metric, swivel, spark plug,
48. extensions and adapters
49. rivet gun
50. scraper (gasket and carbon)
51. screwdriver set
52. seal drivers and extractors
53. soldering tools
54. standard test leads and probes
55. steel rule
56. stethoscope
57. straight edge
58. stud extractor
59. tamper-proof torx set
60. tap and die set (SAE and metric)
61. tap extractor
62. tape and ruler
63. terminal remover tools
64. test lamp –electronics safe (powered and non-powered)
65. thermometer
66. thread files
67. thread pitch gauge
68. tin snips – centre, left and right cut
69. tire pressure gauge
70. tool box
71. torque angle meter/indicator
72. torque limited sockets (torque sticks)
73. torque wrenches – various sizes and ranges
74. torx bits
75. tread depth gauge (for tires and brakes)
76. trouble light
77. tube bending tool
78. tube cutters
79. upholstery tools – trim panel tools, hog ring pliers
80. utility knife
81. vacuum pump
82. vacuum/pressure gauge
83. vernier caliper – SAE and metric
84. vise grips
85. wire brush
86. wire stripper/crimping tool
87. wrench set – SAE and metric/various designs



## Shop Tools and Equipment

1. acetylene torches
2. air bag for alignment adjustments
3. airbag removal tools
4. airbag simulators
5. air buffer
6. air compressor – hoses – inline filter and water separators
7. alignment lift and equipment- 4 wheel
8. angle grinder
9. anti-static devices
10. arbor press
11. ball joint press and adapters
12. battery charger / boosting equipment
13. battery hydrometer
14. battery tester / alternator and starter tester (AVR)
15. bearing remover
16. belt tension gauge
17. bench grinders
18. bench vises
19. black light
20. bottle jacks (2)
21. brake adjustment calipers
22. brake bleeder wrenches
23. brake cylinder hone
24. brake fluid moisture tester
25. brake lathe
26. brake pedal depressor
27. brake pressure tester
28. brake rotor gauge / micrometer
29. brake system bleeder
30. bushing driver set
31. calibrated vessel
32. caliper tools for rear-wheel disc
33. chassis ears
34. brake washer system (for 2 and 4 post hoists)
35. compression leak down tester
36. computer – PC
37. Coolant Ph test strips
38. coolant drain pans
39. cooling system pressure tester
40. cooling system recovery and flushing station
41. diesel compression tester
42. drill press
43. electrical short detector
44. engine cleaning equipment
45. floor jack



46. funnels
47. grease gun and fluid suction pump
48. heat gun
49. heli-coil kits
50. hub service kit
51. hydraulic press
52. jack stands and supports
53. leak detection equipment (refrigerants)
54. leak detection tank (tires)
55. on-vehicle brake lathe
56. oil drain barrels and disposal system
57. parts washers
58. pickle-fork tool set
59. Pitman arm pullers
60. power steering pressure tester
61. presses
62. pressure washer
63. reamer
64. shop vacuum
65. slide hammer
66. smoke machine
67. spreaders (tire)
68. spring compressors – coil spring and strut
69. steering wheel holder
70. steering wheel puller set
71. steering lock plate removal tool
72. steering tilt pin removal tool
73. tie-rod end puller
74. tie-rod sleeve tools
75. tire changing machine (run-flat capable)
76. tire balancer equipment (road force type recommended)
77. tire repair equipment
78. transmission flush equipment
79. TPMS system service tools
80. u-joint press
81. door trim tools
82. vehicle lifts
83. vehicle service information system
84. water hose
85. welding equipment – GMAW welder and oxy fueled





## Measuring Tools and Equipment

1. ABS pressure tester
2. AVR
3. back pressure gauge(exhaust)
4. ball joint dial indicator set
5. brake drum gauge (for brake shoe adjusting)
6. brake drum micrometer
7. battery tester (electronic)
8. coolant system pressure tester
9. DVOM (8 per class of 16)
10. gas cap pressure tester
11. headlight aiming equipment
12. infrared thermometer
13. lab scope or graphing multimeter; (8 per class of 16) {2 channel, digital, curser function with time capture capability}
14. lab scope accessories (shielded cables and back probes)
15. low amp probe
16. logic probe
17. micrometer – SAE and metric
18. oil pressure gauge set – engine / transmission
19. power steering pressure tester
20. pressure gauges
21. scan tools; 8 per class of 16 (CAN bus capable with appropriate software no older than 5 years of current Model Year vehicles)
22. telescoping gauges
23. torque angle meter / indicator



## FOUNDATION TEXT AND MANUAL LIST

### Suggested texts:

<b>Alberta Learning Guides</b>	
7850001029	Measuring Tools
7850001030	Specialty Hand Tools
7850001031	Fastening Devices
7850001868	Introduction to Scan Tools
7850001034	Oxy-Acetylene Heating and Cutting
7850001867	Gas Metal Arc Welding
7850001047	Hydraulic System Components
7850001050	Power Brakes
7850001044	Steering Columns
7850001037	Frames
7850001041	Power Steering
7850001042	Steering Angles
7850001039	Wheels, Hubs and Tires

<b>Author</b>	<b>Title</b>	<b>ISBN</b>
Erjavec	Automotive Technology + Workbook	0-17-610439-9
American Lift Institute	Lifting It Right	ALI SMO1-2

### **Additional Texts**

<b>Author</b>	<b>Title</b>	<b>ISBN</b>
Halderman	Automotive Electricity and Electronics	0-13-084224-9



## GLOSSARY

<b>Adjust:</b>	To bring to a more satisfactory state. To bring the parts of to a true or more effective relative position.
<b>Align:</b>	To bring into alignment.
<b>Analyze:</b>	To examine critically so as to determine appropriate procedures, process or course of action.
<b>Apply:</b>	To put to use especially for some practical purpose.
<b>Assemble:</b>	To fit together the parts of.
<b>Assess:</b>	To determine the value, significance, or extent of; appraise.
<b>Calculate:</b>	To arrive at a precise numerical answer – often through the use of mathematical formulas.
<b>Construct:</b>	To make or form by combining or arranging parts or elements.
<b>Define:</b>	To set forth the meaning of a word or expression.
<b>Demonstrate:</b>	To exhibit, show clearly or perform, to a competency standard, a process or competence.
<b>Describe:</b>	To set forth the properties or characteristics of an object. To give a detailed or graphic account of a process or procedure. (To use correct terminology, sequencing and inter-relationship of the elements is implied where required).
<b>Determine:</b>	To arrive at, or locate, information by a simple process (e.g. by rule of thumb).
<b>Explain:</b>	To show the logical development or relationships of.
<b>Evaluate:</b>	To determine the significance, worth, or condition of usually by careful appraisal and study.
<b>Identify:</b>	To use the correct terminology to describe objects, both individually and collectively; to state their application or use, and to point out and name them.
<b>Inspect:</b>	To look into, or at carefully. To examine, or observe, critically in order to detect flaws, errors, etc.
<b>Install:</b>	To set up for use or service.
<b>List:</b>	To give in point form, several items of information; no sequence or inter-relationship is implied.
<b>Locate:</b>	To seek out and determine the location of.



- Maintain:** To keep in good condition. To keep functional, and in good repair.
- Obtain:** To gain or attain usually by planned action or effort.
- Operate:** To perform a function: exert power or influence.
- Overhaul:** To check thoroughly for needed service, and to make the repairs, replacements, adjustments, etc., necessary to restore to good working order.
- Perform:** To carry out. To do in a formal manner or according to prescribed ritual.
- Rebuild:** To restore to an original state.
- Remove:** To move by lifting, pushing aside, or taking away or off.
- Repair:** To put back into good condition after damage or wear. To mend or fix.
- Replace:** To put something new in the place of.
- Select:** To choose the most appropriate object, process or procedures, given a specific situation; (when used in relation to an object it also implies the ability to identify and describe).
- Service:** To inspect, diagnose, remove, maintain, repair, or replace items and/or components.
- Set up:** To assemble the parts of and erect in position.
- Sketch:** To make a sketch, rough draft, or outline of.
- State:** To set out briefly (in the equivalent of a sentence or two) an idea.
- Test:** To try something against a criterion or standard.
- Troubleshoot:** To investigate a problem. To look at, or into, critically and methodically in order to find out the causes, facts, conditions, etc.
- Use:** The act or practice of employing something.